SCIENCE IS ALL AROUND US

ERASMUS +

Science for All - Innovative teaching and learning methods developed by the Erasmus+ project, SAAU, on science education

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Content

Introduction

We are pleased to present an ebook that highlights the innovative teaching and learning methods developed by the Erasmus+ project, SAAU, on science education. This project, which involves educators from Poland, Romania, Croatia, Portugal, and Turkey, aims to improve science education by introducing new and creative teaching methods that engage and inspire students.

The ebook provides a comprehensive overview of the project's innovative teaching strategies, including games, simulations, and hands-on activities that promote active learning and critical thinking. Each chapter is authored by educators from one of the participating countries and provides detailed explanations of the methods used, along with examples of how they have been implemented in the classroom.

We hope that this ebook will serve as a valuable resource for science educators looking to enhance their teaching practice and inspire their students to engage with science in new and exciting ways.

What are CLIL AND PBL approaches?

BY: **CARMEN DUCU**
SAAU PROJECT COORDINATOR

CLIL (Content and Language Integrated Learning) CLIL is an approach to teaching where content is taught through the medium of a second language, with the aim of improving both subject-specific and language skills. This approach is becoming increasingly popular in schools around the world as it provides an immersive learning experience that is both challenging and rewarding.

In this ebook, we will be exploring a variety of subjects such as science, history, geography, and more, all while practising and improving our language skills. Each lesson will be structured to provide a balance of content and language learning, with a focus on the acquisition of both subject-specific vocabulary and language skills.

Our aim is to provide you with a range of engaging and interactive lessons that will challenge and inspire you. We hope that by the end of this ebook, you will have a deeper understanding of the subject matter covered, as well as improved language skills that you can use both in and outside the classroom.

So, whether you are a student looking to improve your language skills, or a teacher looking for engaging CLIL lesson ideas, we hope that you will find this ebook both informative and useful. Let's get started!

PBL (Project-Based Learning) is an educational approach that centers on the creation and completion of a project as the primary mode of learning. The project itself is designed to be a multifaceted, real-world challenge that requires students to use a variety of skills and knowledge to complete. PBL is based on the principle that people learn best when they are actively engaged in solving real-world problems and challenges.

PBL is a student-centered approach to teaching that emphasizes collaboration, critical thinking, and problem-solving. Students work in teams to identify a problem or challenge, conduct research, design and develop a solution, and present their findings to their peers and other stakeholders. Throughout the process, students are encouraged to think critically, ask questions, and reflect on their learning.

PBL is based on the idea that learning should be an active and engaging process. It provides students with an opportunity to learn through inquiry, exploration, and experimentation. By working on real-world challenges, students are able to see the relevance of what they are learning and develop skills that are relevant to their future careers and lives.

One of the strengths of PBL is that it promotes deep learning by allowing students to make connections between different subjects and apply their learning to real-world problems. It also encourages students to take ownership of their learning and develop the skills they need to succeed in the 21st century, such as collaboration, communication, and problem-solving.

In summary, PBL is an innovative approach to teaching and learning that engages students in authentic, real-world challenges. It fosters collaboration, critical thinking, and problem-solving skills, while promoting deep learning and relevance. PBL has been successfully implemented in many educational settings, from secondary to higher education, and is a powerful tool for preparing students for success in the 21st century.

Innovative Teaching Approaches

The flipped classroom is an innovative teaching approach that involves reversing the traditional roles of classroom time and homework. In a flipped classroom, students are introduced to new material outside of class time through videos, readings, or other multimedia resources, while class time is used for discussion, problem-solving, and group activities.

The flipped classroom approach allows students to learn at their own pace and on their own schedule, which can be particularly beneficial for students who need additional support or struggle with traditional classroom learning. Students can pause and re-watch videos, take notes, and review materials as many times as they need to fully understand the material.

During class time, the teacher is available to answer questions, facilitate group activities, and provide personalized instruction to individual students or groups. This approach encourages collaboration, critical thinking, and problem-solving skills, and allows for more individualized attention to each student's needs.

One of the key benefits of the flipped classroom approach is that it allows for a more student-centered approach to learning. Students take more responsibility for their own learning, and the teacher serves as a facilitator and coach rather than a lecturer. This approach can be particularly effective in promoting engagement and motivation, as students are actively involved in the learning process and have more control over their own learning.

Another benefit of the flipped classroom is that it allows for more efficient use of class time. By introducing new material outside of class time, the teacher can use class time for more interactive, engaging activities that help students to apply and deepen their understanding of the material.

All in all, the flipped classroom is an innovative teaching approach that reverses the traditional roles of classroom time and homework. It promotes collaboration, critical thinking, and problem-solving skills, and allows for a more student-centered approach to learning. The flipped classroom approach has been successfully implemented in a variety of educational settings, and can be a powerful tool for improving student engagement,

Rotation centers and gallery walks are two powerful instructional strategies that can be used in teaching to promote active engagement and enhance student learning.

Rotation centers involve setting up several stations, each with a different activity or task. Students move from one station to the next in small groups, spending a set amount of time at each center. The activities can vary depending on the content and skills being taught, and can include things like hands-on experiments, research projects, or small group discussions. By rotating through the different stations, students are exposed to a variety of learning experiences, and are given the opportunity to work collaboratively with their peers.

Gallery walks involve students moving around the classroom to view and analyze different artifacts or displays, such as posters, artwork, or written pieces. The artifacts are often created by the students themselves, and can be used to showcase their learning or to demonstrate mastery of a particular skill or concept. Students are encouraged to ask questions, make connections, and provide feedback to their classmates, promoting a sense of community and shared learning.

Both rotation centers and gallery walks offer several benefits in teaching. They can help to increase student engagement and motivation, as well as foster collaboration and social interaction. They also provide opportunities for differentiated instruction, as students can work at their own pace and level, and receive feedback from their peers and the teacher. Additionally, these strategies can help to develop critical thinking and problem-solving skills, as students are required to analyze and synthesize information from multiple sources.

In conclusion, rotation centers and gallery walks are valuable instructional strategies that can be used to enhance student learning and engagement. By incorporating these approaches into teaching, educators can provide their students with meaningful and interactive learning experiences that promote active participation and deep understanding of the content.

Innovative Teaching Approaches

Games can be an effective tool for teaching science, as they provide an engaging and interactive way for students to explore scientific concepts and principles. There are many different types of science games, ranging from board games and card games to digital games and simulations.

One benefit of using games in science education is that they can help to make abstract or complex concepts more concrete and accessible. Games can provide a visual representation of scientific phenomena or allow students to manipulate variables in a controlled environment. This can help students to better understand scientific principles and develop a deeper appreciation for the natural world.

Another advantage of using games in science education is that they can promote collaboration and teamwork. Many science games require players to work together to solve problems or achieve a common goal. This can help students to develop communication skills and learn how to work effectively in a group setting, which are important skills for success in science and in life.

Games can also be a useful tool for assessment and evaluation in science education. By playing games, students can demonstrate their understanding of scientific concepts and principles in a fun and engaging way. This can provide teachers with valuable information about their students' knowledge and skills, and can help to inform future instruction.

Overall, games can be a valuable addition to any science curriculum. They provide an interactive and engaging way for students to explore scientific concepts and principles, promote collaboration and teamwork, and can be a useful tool for assessment and evaluation. By incorporating games into science education, educators can help to foster a love of science and inspire the next generation of scientists and innovators.

Web 2.0 tools have significantly transformed the landscape of teaching and learning, revolutionizing traditional educational practices and opening up new possibilities for educators and students. These tools leverage the interactive and collaborative nature of the internet, enabling educators to create engaging and dynamic learning environments. Here are some key roles of Web 2.0 tools in teaching:

Collaboration and Communication: Web 2.0 tools facilitate seamless collaboration and communication among students and teachers. Platforms like Google Docs, Microsoft Office 365, and online discussion forums enable real-time collaboration on projects, document sharing, and feedback exchange. These tools promote teamwork, peer learning, and the development of essential communication skills. Students can actively engage with their peers and educators, fostering a sense of community and enhancing their learning experience.

Content Creation and Sharing: Web 2.0 tools empower students to actively create and share their own content. Blogging platforms like WordPress, multimedia presentation tools like Prezi, and video creation tools like Flipgrid allow students to express their ideas, showcase their creativity, and develop digital literacy skills. They can publish their work online, share it with a wider audience, and receive feedback from peers or experts in the field. This promotes critical thinking, creativity, and digital citizenship skills.

Personalized Learning: Web 2.0 tools support personalized learning experiences tailored to individual students' needs. Adaptive learning platforms like Khan Academy and personalized learning management systems enable students to progress at their own pace, receive targeted feedback, and access resources that match their learning preferences and abilities. These tools empower students to take ownership of their learning journey, fostering self-directed learning skills and promoting academic success.

Multimedia and Interactive Learning: Web 2.0 tools offer a wide range of multimedia resources and interactive activities to make learning engaging and interactive. Interactive simulations, virtual reality (VR) experiences, and educational games enhance student understanding and retention of complex concepts. Platforms like Nearpod, Quizlet, and Kahoot provide interactive quizzes, flashcards, and gamified learning experiences that make learning fun and memorable. These tools cater to different learning styles and promote active engagement in the learning process.

Global Connections and Cultural Exchange: Web 2.0 tools facilitate global connections and cultural exchange in education. Social media platforms, video conferencing tools, and online platforms for global collaboration, such as eTwinning or PenPal programs, enable students to connect and collaborate with peers from different countries and cultures. These tools promote intercultural understanding, empathy, and the development of global citizenship skills. Students can gain insights into different perspectives, broaden their horizons, and develop a global mindset.

CLIL
Content and Language Integrated Learning

TÜRKIYE

Ahmet Hamdi Gökbayrak Fen Lisesi

BURSA, TÜRKIYE

ORGANISATION ID: **E10185971**

LESSON PLAN

SCIENCE
GEOGRAPHY/PHYSICS/ENGLISH

"Alternative energy sources"

LEVEL: 9-10

CLASS SIZE: 30 students

AIMS/INTENDED LEARNING OUTCOME: Recognizing the positive and negative effects of renewable and non-renewable energy sources and identifying alternative energy sources.

MATERIALS: Preparing the necessary material (computer, presentation system, etc.)
TIME: 100 minutes

AUTHOR: Raşit Geçal

TIME/ INTER	STAGE	AIM	PROCEDURE
5' WG	Warm up + Presentation	Check Students' previous knowledge	1. The teacher starts with a story like the following: Visiting various cities of the country, Ahmet sees wind turbines in Çanakkale, natural gas cycle power plant in Bursa, thermal power plant in Muğla Yatağan, geothermal power plant in Denizli, Keban hydroelectric power plant in Elazig, solar energy fields in Erzincan. He thinks that the energy will run out one day. He is alarmed by the possibility of running out of energy. Various questions cross his mind: Will we be left in the dark when fossil fuels run out? How do you think we can alleviate our concerns about the future about energy? It starts working with a question.
12' GW - WG	Presentation	Present vocabulary about the Scientific Method: Question, Hypothesis, Experiment, Method, Data Analysis, Results, Conclusion	2 Your phones are powered by electricity. You reach the school when cars consume fuel. So, what do we do if these energy sources (gasoline, coal, etc.) we use run out? Based on this question, the teacher tells the students that they will do the following: 1. Researching the energy sources we use (division of work should be done) 2. Classification of energy sources as renewable/non-renewable (must cooperate) 3. Determining the advantages and disadvantages of energy resources (cooperation should be done) 4. Preparing the necessary materials (computer, presentation system, etc.) for the presentation 5. Prepare a presentation 6. Presenting
3’	BRAIN BREAK	Promote learning	Questions that increase students' sense of curiosity are asked: 1. What are renewable energy sources? 2. What are non-renewable energy sources? 3. Are manure and nuclear energy renewable energy sources? 4. What are the events that pollute our environment? 5. What is the reserve of fossil fuels? 6. Are renewable energy sources of sufficient size?
5' Ind - PW	Practice 1	TASK 1: Creation of Teams.	2 separate groups for renewable energy sources 2 groups for non-renewable energy sources Note: Groups should consist of approximately equal numbers of students, and the teacher should take care to include students of all skills in a group.
6' GW - WG	Practice 2	TASK 2: Determining Sub-Questions, Planning the Information Gathering Process	Students should seek answers to the following questions during their research: 1. What are renewable energy sources? 2. What are non-renewable energy sources? 3. Are manure and nuclear energy renewable energy sources? 4. What are the events that pollute our environment? 5. What is the reserve of fossil fuels? 6. Are renewable energy sources of sufficient size? 7. Are there any countries that meet their energy needs with renewable energy sources? 8. What is the renewable energy potential of our country? 9. What are the disadvantages of being dependent on foreign energy? 10. The amount of energy obtained with one ton of uranium corresponds to how many tons of coal? 10. What are you doing to save energy? 11. Can water flowing from the faucet be an example of waste of energy?

TIME/ INTER	STAGE	AIM	PROCEDURE
6' Ind - PW	Practice 3	TASK 3: Creating the Work Schedule	1 Researching the energy sources we use (division of work should be done) 1 day 2 Classification of energy sources as renewable/non-renewable (must cooperate) 1/2 day 3 Determining the advantages and disadvantages of energy sources (cooperation should be done) 1/2 day 4 Preparation of the necessary materials (computer, presentation system, etc.) for the presentation 1/2 day 5 Presentation preparation 2 days 6 Delivery 1/2 day
3’	BRAIN BREAK	Promote learning	7. Planes are made with origami and the planes made are raced.
12’ Ind. – PW – GW – WG	Production	Promote Awareness Raising and Critical Thinking	8. Our water footprint is calculated with the given application. https://www.kaski.gov.tr/Cdn/ayakizi.php By calculating the water footprint, they notice the definitions of green, gray and black water. Everyone is discussing what can be done to protect and increase green water. Finally, by making a presentation, all groups share the information they have reached.
3’	BRAIN BREAK	Promote learning	9. What is the amount of fresh water in the world? Then the amount per person is calculated.
14' T-S-S	Production	Allow Ss to retrieve what they’ve learned and apply this knowledge	10. Students are required to collect and classify data in accordance with the following configuration. The teacher should pay attention to whether the energy sources are determined in sufficient quantities. The teacher should pay attention to whether the energy sources are classified correctly or not. The teacher should pay attention to whether the students determine the energy sources that should be preferred in the future, based on the advantages and disadvantages of energy sources. It is expected that the students will have concluded that renewable energy sources should be preferred in the future. Based on the question of which energy sources can be used effectively in our country, students are expected to comment on renewable energy sources. If this expectation cannot be met, the situation should be discussed in the classroom during the presentation, and the presentation should be examined by asking questions.
3’	BRAIN BREAK	Promote learning	11. The game of finding the countries that are rich in water is played.
18’ GW	Production	Apply their knowledge critically	12. Energy sources are divided into two as renewable and non-renewable. It is the primary duty of every individual living in the country to prevent the rapid consumption and unconscious use of energy resources, which make our life easier in every sense and increase our living comfort. Teachers and students have a great responsibility in understanding the importance of renewable energy sources and in developing the awareness that renewable energy sources should be preferred in the use of energy sources. It is expected that this idea will be adopted by everyone in the groups. Awareness has arisen.

Homework suggestion

1. **EXTENSION:** Students can calculate their carbon footprint using different applications.

   https://yesilbiradim.com/

LESSON PLAN

SCIENCE GEOMETRY/ICT/ENGLISH

"Function graphs"

LEVEL: 11

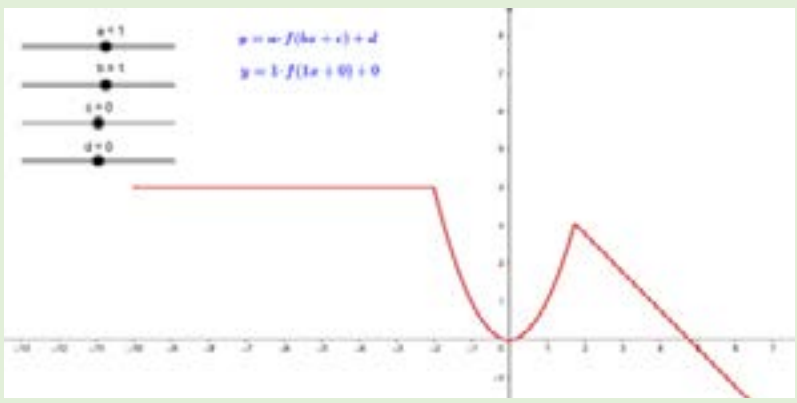
CLASS SIZE: 30 students

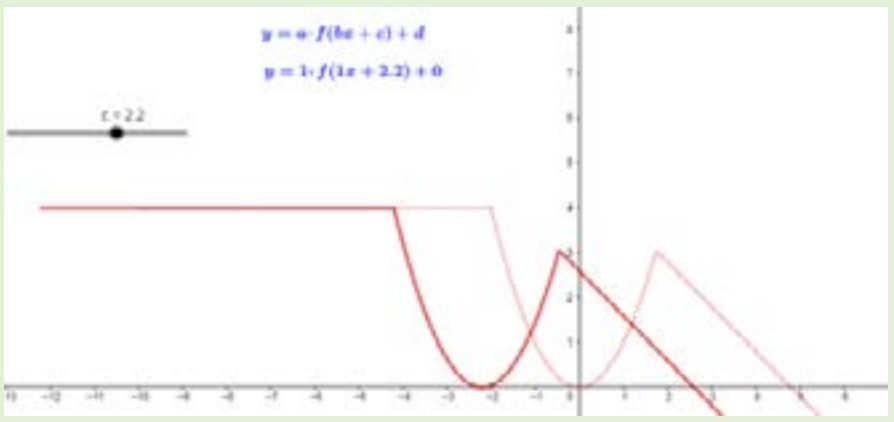
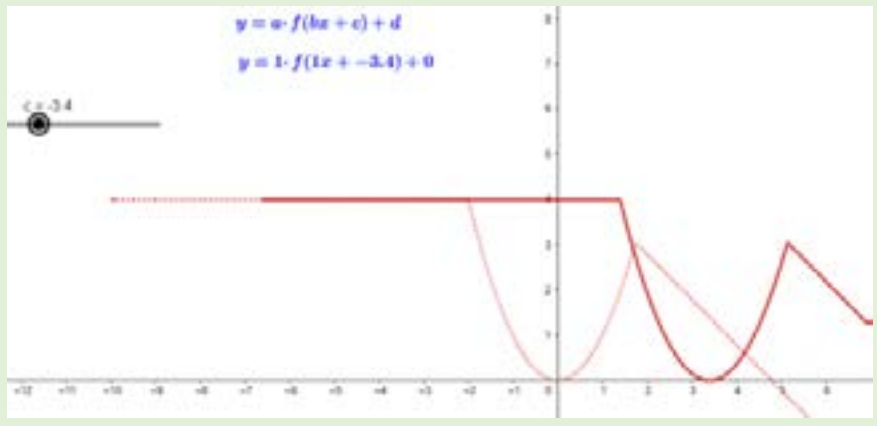
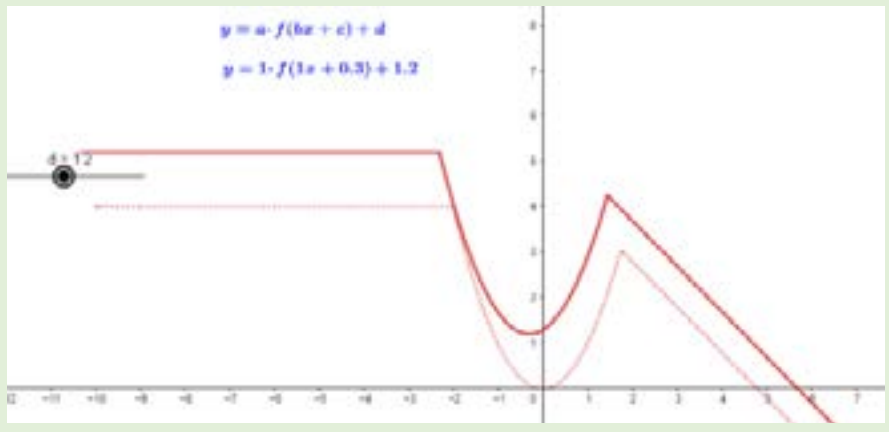
AIMS/ INTENDED LEARNING OUTCOME: Draws new function graphs from the graph of a function with the help of transformations. Recognizes the result of a graph moving left and right along the X-axis. Recognizes the consequences of moving a graph up and down along the Y-axis. Gets the symmetry of a graph about the x-axis and about the y-axis.

MATERIALS: Dynamic geogebra math program, ogm material website dynamic applications, Structured worksheets.

TIME: 100 minutes

AUTHOR: Raşit Geçal

TIME/ INTER	STAGE	AIM	PROCEDURE
5' WG	Warm up + Presentation	Check Students' previous knowledge	1. Ask them how they can graph a function. What should be done to translate this drawn graph along the axes?. What does it mean to get symmetry of this graph with respect to the axes. Have them question them.
12' GW - WG	Presentation	Present vocabulary about the Scientific Method: Question, Hypothesis, Experiment, Method, Data Analysis, Results, Conclusion	2. Structured worksheets are distributed to each student. First of all, it is ensured that the questions in each step are answered in order. Volunteers are expected to respond. In this way, an incubation period is created on the question. Discussed on different answers. After this stage, the given graph is translated along the x-axis with the help of the geogebra program. Comparisons are made with the answers given by the students. In the last stage, they are asked to answer the first question in a general framework on the worksheets.
3'	BRAIN BREAK	Promote learning	3. With the help of the Geogebra program, each student is asked to play the graphics on the smart board. They notice the dances of the chart.
5' Ind - PW	Practice 1	TASK 1: For the a.f(bx+c)+d function, complete the following tasks with the help of geogebra program.	 1.In the a.f(bx+c)+d function, how do the arms of the function change as the value "a" increases in absolute value? Please comment. Test these comments by applying them in the geobegra program.
6' GW - WG	Practice 2	TASK 2: a.f(bx+c)+d function, complete the following tasks with the help of geogebra program.	2. How does the graph change when the value "a" takes a negative value in the a.f(bx+c)+d function? Please comment. Test these comments by applying them in the geogebra program. 3. How does the graph change when the value "b" takes a negative value in a.f(bx+c)+d function? Please comment. Test these comments by applying them in the geogebra program. 4. In the a.f(bx+c)+d function, how does the graph change as the value of "b" gets larger? Please comment. Test these comments by applying them in the geogebra program.

6' Ind - PW	Practice 3	TASK 3: a.f(bx+c)+d function, complete the following tasks with the help of geogebra program.	5. In the a.f(bx+c)+d function, how does the graph change as the value of "c" gets larger? Please comment. Test these comments by applying them in the geogebra program.  6.In the a.f(bx+c)+d function, how does the graph change as the value of "c" gets smaller? Please comment. Test these comments by applying them in the geogebra program.  7.In the a.f(bx+c)+d function, how does the graph change as the "d" value gets smaller? Please comment. Test these comments by applying them in the geogebra program.
			8.In the a.f(bx+c)+d function, how does the graph change as the value of “d” gets larger? Please comment. Test these comments by applying them in the geogebra program. 
3’	BRAIN BREAK	Promote learning	7. Function applications test is done at https://ogmmateryal.eba.gov.tr/dynamic-uygulamalar/matematik?s=8&d=50&u=250&k=0.
12’ Ind. – PW – GW – WG	Production	Promote Awareness Raising and Critical Thinking	https://ogmmateryal.eba.gov.tr/dynamic-uygulamalar/matematik?s=8&d=50&u=250&k=0 Function application examples from the website are discussed with the class. Different functions are tested in practice.
3’	BRAIN BREAK	Promote learning	9. Unusual function drawings are made with the help of programs. These plotted functions are shifted.

14' T-S-S	Production	Allow Ss to retrieve what they've learned and apply this knowledge	10.When you make the desired steps on the given function graph, compare the results of the program with the situation you think will happen. Do they have different situations than yours? discuss. Try to generalize the results you reach in the program. Does this generalization work for every graph? discuss
3'	BRAIN BREAK	Promote learning	11. Color and visualize the translational symmetry states applied to the drawn function and find the best one.
18' GW	Production	Apply their knowledge critically	12. At the end of the lesson, each student walks around the other students to review their work. Each student's work is then posted on the board. The whole class examines the drawings. different and special drawings are observed by everyone once again. Different experiences are gained. They are allowed to share different works that they imagine.

Homework sugestion

EXTENSION 1: Ask students to complete the ogm.material application so that they can make different drawings.

https://ogmmateryal.eba.gov.tr/panel/upload/dinamik/dinamik-24648/MAT11S153/index.html

https://ogmmateryal.eba.gov.tr/dinamik-uygulamalar/matematik?s=8&d=50&u=250&k=0

LESSON PLAN

SCIENCE MATHS/ARTS/GEOMETRY/ CHEMISTRY/ICT/ENGLISH

"Make maths fun"

LEVEL: 9-10

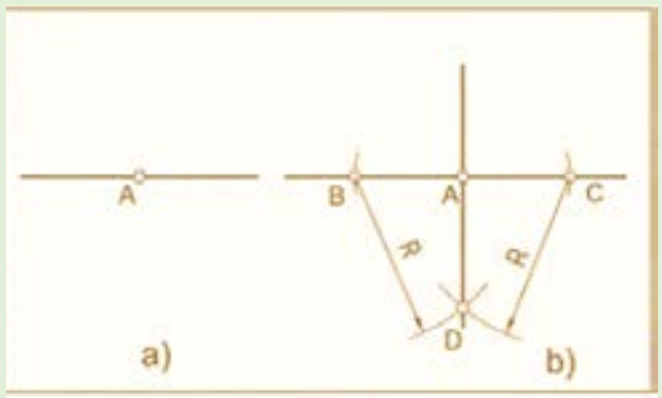
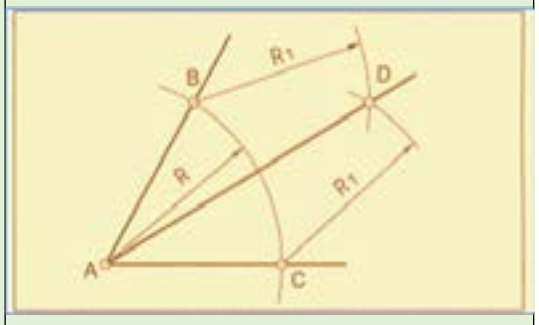
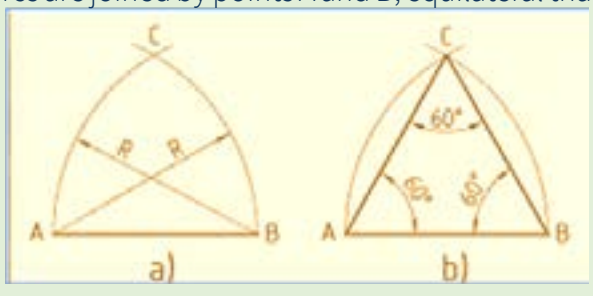
CLASS SIZE: 30 students

AIMS/ INTENDED LEARNING OUTCOME: At the end of the lesson, students will be able to draw a real triangle. They will be able to make cubes with origami. They will be able to use three-dimensional geometric shapes in a more concrete way. Their estimation success will increase. And they will be able to use them in real life problems.

MATERIALS: compass, ruler and scissors. Paper in 6 different colors. Euclideia geometric drawing app. Angle estimation game (in computer environment) prepared with Geogebra.
Sun clock. an object that can be measured outdoors.

TIME: 100 minutes

AUTHOR: Raşit Geçal

TIME/ INTER	STAGE	AIM	PROCEDURE
5' WG	Warm up + Presentation	Check Students' previous knowledge	1. Ask what an equilateral triangle is. Ask them how they can draw an equilateral triangle and have a student draw it on the board. If the student draws this triangle, have him question whether it is a triangle with real dimensions. And confirm the answer with certainty that the real triangle is not drawn.
12' GW - WG	Presentation	Present vocabulary about the Scientific Method: Question, Hypothesis, Experiment, Method, Data Analysis, Results, Conclusion	2 students are divided into groups. Each group is given the tasks they need to draw in order. The groups exchange ideas among themselves and discuss how they can draw the given task. And they do their drawings. All groups are asked to draw their drawings. Correct drawing steps are drawn on the smart board step by step as a class. Incorrect steps are detected. The group dynamic is constantly kept alive. It is emphasized that a scientific real drawing is made.
3'	BRAIN BREAK	Promote learning	3. Make as many different drawings as you can.
5' Ind - PW	Practice 1	TASK 1: Drawing a perpendicular to point A on the line.	4. STEP 1: Points B and C are drawn by drawing an arc with point A being the center on the line.is found. STEP 2: Point D with an arc of the same radius drawn outside the line with B and C being the center obtained 
6' GW - WG	Practice 2	TASK 2: Bisecting an Angle.	5 . Step 1: With the compass opened by radius R, the apex of the angle (A) is the center. is drawn. There are points B and C. Step 2: The intersection point D of the arcs drawn by taking the B and C points as the center is found. Step 2: When points A and D are joined, the angle is bisected. 
6' Ind - PW	Practice 3	TASK 3: Drawing an Equilateral Triangle with the Help of a Compass	6 Step 1: Compass Triangle side opens up to AB and A and B are the center R arcs is drawn. Step 2: When the arcs are joined by points A and B, equilateral triangle ABC is drawn. 
3'	BRAIN BREAK	Promote learning	7. Play the angle guessing game

TIME/ INTER	STAGE	AIM	PROCEDURE
12’ Ind. – PW – GW – WG	Production	Promote Awareness Raising and Critical Thinking	8. Ss Make drawings with the euclidea app https://www.euclidea.xyz/en/game/packs/Alpha/level/TEquilateral With the euclideia application, where they can download the drawings made with compass and ruler to their phones, they are enabled to notice new and different drawings. The drawing steps are completed by the groups discussing among themselves.
3’	BRAIN BREAK	Promote learning	9. make cubes with origami
14’ T-S-S	Production	Allow Ss to retrieve what they’ve learned and apply this knowledge	10. Compare the drawings they made with compass and ruler with the euclidea application. Summarize what similarities and differences there are. Realize that a drawing can be drawn in different ways. Compare the cubes you make with origami. Examine the 3D structure of the cube. Visualize how it is made from paper.
3’	BRAIN BREAK	Promote learning	11.Walk around and ask who made the most beautiful origami cube.
18’ GW	Production	Apply their knowledge critically	12. At the end of the lesson, each group goes around the other groups to examine their work. Then the work of each group is posted on the board. The whole class examines the drawings. different and special drawings are once again observed by everyone. Different experiences are gained. They are allowed to share different works that they imagine.

Homework suggestion

1. **EXTENSION:** Ask students to complete the euclidea application so that they can make different drawings.
2. https://www.euclidea.xyz/en/game/packs/Alpha/level/TEquilateral

LESSON PLAN

SCIENCE
BILOGY/ICT/ENGLISH
"Aquatic life"

LEVEL: 14-16 yo

CLASS SIZE: 28 students

AIMS/ INTENDED LEARNING OUTCOME: The purpose of this lesson is to raise awareness about the impact of environmental pollution on aquatic life. It is aimed that students buy two aquariums and add phosphorus and sulphate-containing substances without aeration, and the other is just aerated and note the differences between the two environments. It is expected that they will report how they affect aquatic life and produce a final product by preparing a poster.

MATERIALS: two aquariums, lake water, aquarium air motor, phosphorus and sulfate

TIME: 100 minutes

AUTHOR: Fatma Burcu Toprak

TIME/ INTER	STAGE	AIM	PROCEDURE
10' WG	Warm up + Presentation	Review the necessary knowledge.	The teacher first explains what aquatic ecosystems are, pollutants and how these elements affect life in the water.
40'	Activity1	To promote group work.	The students are divided into groups, searching this subject and getting an idea, each group member joins the other groups and expresses their opinions. Thus, new views and ideas emerge. Necessary materials are provided for two different experimental setups. One of the experimental setups is arranged as the control group and the other is the experimental group. The relevant materials are put into the setups.
	BREAK		1 week
10’	Activity 2	To observe how pollutants can make changes even in a small area experimentally.	After waiting for 1 week, it was observed that there was no algae in the water in the group (Control group) where ventilation was done and there was no pollutant. In the group where aeration is made and pollutants are added, it is seen that the water becomes cloudy and green color formation occurs.
20'	Activity 3	Promote learning with ICT tools	A poster is prepared using web 2.0 tools, with information about the test results and observation data.
10'	Conclusion	To raise aweness about pollution	The teacher asks the students what can be done to avoid the pollution in water and the students give their ideas on the topic. They can also present their ideas by using web 2.O tools or posters

Assessment

The teachers prepare a survey on google forms which include some factors below:

- Did you learn about the relationship between life in water and environmental pollution in this course?
- Do you think you have gained skill in preparing experimental setup?
- Do you think these lessons were fun and productive?

LESSON PLAN

SCIENCE MUSIC/BIOLOGY ICT/ENGLISH

"Singing birds"

LEVEL: 14-16 yo

CLASS SIZE: 28 students

AIMS/ INTENDED LEARNING OUTCOME: : The purpose of this lesson is to raise awareness of climate change, adaptation and biodiversity in the students through integration of the musical activities to the subject. In this direction, birds whose diversity has decreased due to climate change have been selected as the main subject in various studies, materials that will allow observation in their natural environment have been searched and it is aimed to record the sounds made by birds. These sounds are evaluated musically, and the video creation is designed as a final product.

MATERIALS: Sensor camera, smart birdfeeder, bird meal, musical instruments (piano, guitar, flute etc…), smart phone, tree

TIME: 100 minutes

AUTHOR: Fatma Dağdelen

TIME/ INTER	STAGE	AIM	PROCEDURE
10' WG	Warm up + Presentation	Intrıduce the topic.	Teacher introduces the term biodiversity, what kind of problems we have due to the fact of climate change, what we can do to mitigate this situation and what species of birds can be found in our region. In groups, students discuss climate change and its effects on birds. Then they tell their opinions. The teacher manages the opinions over a smart bird feeder.
40'	Activity1	To observe the bird species by using a bird feeder..	After provision of sensor camera and Smart bird feeder, they are placed on a tree at the school garden. Bird feeder is filled with birdseed. The applications which are necessary to observe the birds are uploaded to the smartphones.
	BREAK		1 week
10’	Activity 2	The student conducts and documents biological observations and experiments	It is investigated whether there is a difference in the bird variety of our country between previous years and now.. İf there is a loss, what can be the effect of this? They can make a brainstorm.
20'	Activity 3	Promote learning with music and ICT tools	Students make a video by using video maker programs like adobe premiere, viva video, inshot etc… The main purpose is to combine bird sounds to create a melody.
10'	Production	To perform the notes on a musical instrument.	Students try to find frequencies of these voices on the video. Then they can write the notes of them on MuseScore tool. Now they can play these notes on the piano, flute or other instruments.

Assessment

The teachers prepare a survey on google forms which include some factors below:

- What kind of problems we can face in the future because of climate change?
- Why is biodiversity so important?
- Do you think music is a way of raising awareness in this subject and announce them to wider masses?
- Did you have a good time in the lessons?
- Which keywords are meaningful with this lesson for you?

POLAND

Technikum Informatyki Edukacji Innowacyjnej

ŁÓDŹ, POLAND

ORGANISATION ID: **E10117366**

LESSON PLAN

SCIENCE

ARTS/ICT/ENGLISH

"Geometric Abstraction – Polish and World Modern Art"

LEVEL: B1

CLASS SIZE: 20 students

AIMS/ INTENDED LEARNING OUTCOME: By the end of the lesson, students will be able to create an abstract work of art that is made by repeating geometric shapes and lines, use concise instructions to reproduce the artwork.

MATERIALS: PowerPoint presentation, tablets, personal computers or laptops, interactive smartboard for demonstration, pencils, erasers, rulers, white paper, paints, markers, video about abstract drawing, images of artworks.

TIME: 120 minutes

AUTHOR: Piotr Izydorczyk

TIME/ INTER	STAGE	AIM	PROCEDURE
15'	Warm up + Presentation	Check Students' knowledge and introduction to the topic	Students are introduced with geometric abstraction. They are told about non-representational shapes and lines based on geometric forms to create a composition. Images are used to help explain the difference between the art that represents a real life objects and abstract art and then finally geometric abstraction. Students are acquainted with representatives of Polish modern art examples. Questions are asked to check what students know about geometric abstraction, what ensures that the shapes are the same, what allows shapes to be different and were the given instructions easy or difficult to follow.
5’	BRAIN BREAK	Promote learning	Students try to remember everything they know about geometric abstraction.
15'	Practice 1	Build students confidence with the new knowledge	Each student receives paper card, pencil, eraser, ruler. Students try to create an artwork in geometric abstraction style. Students then compare their solutions with other students.
20'	Practice 2	Geometric Abstraction – watching a short video	https://www.youtube.com/watch?v=CC6UMAGcNGY Watch the movie and determine: - characteristics of geometric abstraction style; - how geometric forms create a composition; - concise instructions to create shapes.
5’	BRAIN BREAK	Promote learning	Students discuss the newly acquired information.
30'	Production	Give students more autonomy. Geometric Abstraction – production of works. Allow students to test their understanding	Students are given papers, rulers, paints, pencils. Each student has to prepare a work in a geometric abstraction style on paper in the following formats: 100x70, 50x70, 35x50. Students use concise instructions to create shapes, lines, circles, squares. They experiment with repetition, scale, variation and color. Students can work in pairs if they want to.
30’	Production	Allow students to retrieve what they have learnt and apply their knowledge critically	Students present their works to others and join the public discussion on their geometric abstraction works. Students should talk about the shapes, lines, variety of light (if possible) that will give their art depth of perspective. Students can choose the name for their works after they have completed their drawings. Students can discuss what they see in each drawing. Students’ arts exhibition.

Homework Suggestions

1. Ask students to prepare at least two drawings based on geometric abstraction style.

2. Ask students to find out and prepare a short presentation about the most important representatives of geometric abstraction style.

LESSON PLAN

SCIENCE
BIOLOGY/ENGLISH

"Photosynthesis: Autotrophic nutrition of organisms"

LEVEL: B1

CLASS SIZE: 20 students

AIMS/ INTENDED LEARNING OUTCOME: By the end of the lesson, students will be able to explain the role of pigments and the photosystem in photosynthesis. They will distinguish between the importance of the light-dependent phase and the light-independent phase. Students will explain the concepts of autotrophy (a way of nourishing organisms, consisting in the independent production of organic compounds from simple inorganic compounds), photosynthesis and chemosynthesis.

MATERIALS: Test tubes, plants, lighting, sparkling water, demineralized water, paper, pens, online film, laptops.

TIME: 90 minutes

AUTHOR: Maria Kowalska

TIME/ INTER	STAGE	AIM	PROCEDURE
10'	Warm up + Presentation	Check Students' knowledge and introduction to the topic	Students are introduced with the process of photosynthesis. They have to watch online film. They are asked questions what they know about this process.
5’	BRAIN BREAK	Promote learning	Students try to remember everything they know about photosynthesis.
10'	Practice 1	Build students confidence with the new knowledge	Students are divided into 5 groups. Each group has to implement an experiment on the production of oxygen by the plant. They are explained the role of pigments and the importance of the light-dependent and the light-independent phase.
5’	BRAIN BREAK	Promote learning	Students discuss the newly acquired information. They can ask questions about concepts of autotrophy, photosynthesis and chemosynthesis.
50'	Practice 2 and Production	The experiment – improving abilities of implementing the process of oxygen production. Allow students to test their understanding	Students work on the following task. They have to obtain an effect showing the production of oxygen by the plant. The longer it was illuminated, the more gas is produced by the marsh. The vegetation in the home aquarium functions in a similar way. The energy that comes from the light is converted into the energy of chemical compounds. During the experiment, it can be observed that carbon dioxide is absorbed and that oxygen is a by-product that can be observed in the form of air bubbles. During the experiment students observe changes and make notes. They can exchange their own observations.
10’	Production	Allow students to retrieve what they have learnt and apply their knowledge critically	Students comment on the activity. They should say positive and negative comments. They have to explain the difference between the light-dependent phase and the light-independent phase. They should explain every step of the process of photosynthesis.

Resources

Online sources: https://www.youtube.com/watch?v=Pgylvlhq39g

Homework Suggestions

1. Ask students to write the 7 steps of photosynthesis.
2. Ask students to explain why photosynthesis can’t occur at very high temperatures.

LESSON PLAN

SCIENCE

BIOLOGY/ENGLISH

"The microscopic world hidden in a drop of water"

LEVEL: B1

CLASS SIZE: 21 students

AIMS/ INTENDED LEARNING OUTCOME: By the end of the lesson, students will be able to differentiate between water from clean and dirty environments. They will become familiar with substances and organisms presented in the water, they will learn how to use a microscope and how to prepare their own microscope slides.

MATERIALS: P Three containers with water, one from a lake (or a different body of water), one from a pool and one from a bottle of mineral water, microscopes, microscope slides and coverslips, pipettes, paper, pen, tissues in case of an emergency, nitrile gloves, interactive smartboard for demonstration.

TIME: 90 minutes

AUTHOR: Maria Kowalska

TIME/ INTER	STAGE	AIM	PROCEDURE
10'	Warm up + Presentation	Check Students' knowledge and introduction to the topic	Students are introduced to ecosystems that exist in water from different sources. They have to watch online film. They look at pictures of microscopic organisms and become acquainted with their life. They are asked questions what they know about microscopic life in a drop of water.
5’	BRAIN BREAK	Promote learning	Students try to remember everything they know about microorganisms and substances presented in water.
10'	Practice 1	Setting up the experiment	Students are divided into three groups of seven people. Each group sets their equipment and gets ready to proceed with the water experiment. The groups revise the instructions needed to examine the samples of water given to them.
5’	BRAIN BREAK	Promote learning	Students discuss between themselves which samples of water they use and compare.
50'	Practice 2	Examination of organisms	Each group examines water droplets under the microscope and describes them on the sheet of paper. Pupils search what kind of microorganisms could be living in the water that they are examining.
10’	Production	Allow students to retrieve what they have learnt and apply their knowledge critically. Evaluation	Students discuss and evaluate with each other which of the samples of water are the most safe to drink. Pupils also discuss how the environment affects the anatomy of the microorganisms. Students comment on the activity. They should say positive and negative comments.

Resources

Online sources: https://www.youtube.com/watch?v=SGPflE5eHrU

Homework Suggestions

1. Ask students to make a presentation about the life forms they found in the water during the experiment
2. Ask students to write what microscoping organisms are in drops of water: one from a lake or a different body of water, one from a pool and one from a bottle of mineral water.

LESSON PLAN

SCIENCE
GEOGRAPHY/ENGLISH
"Księży Młyn (Priest's Mill) – Orienteering Game"

LEVEL: B2

CLASS SIZE: 30 students

AIMS/ INTENDED LEARNING OUTCOME: By the end of the lesson, students will be able to find locations in a specific order, remember locations, remember a sequence of clues, learn how to follow a map. Students will understand the rules and safety considerations of the orienteering game, read a map by understanding map symbols, apply the tactics of route planning and orient themselves by using the map, the compass and the terrain.

MATERIALS: Map of Księży Młyn (Priest's Mill) area, images of locations, set of rules of the game, a compass

TIME: 180 minutes

AUTHOR: Paulina Adryańczyk-Linard, Dorota Wesołowska, Dominik Wróblewski

TIME/ INTER	STAGE	AIM	PROCEDURE
20'	Warm up + Presentation	Check Students' knowledge and introduction to the topic	Students are introduced with the history of the Priest's Mill area. They are told about a group of textile factories and associated facilities located in center of Łódź. Students are told about the development of this region, its important role in Łódź and Polish territory in the 19th Century. They are told about the owners of textile factories who contributed to the development of Łódź.
5'	BRAIN BREAK	Promote learning	Students try to remember everything they know about Priest's Mill area and briefly review the importance of gathering.
10'	Practice 1	Build students confidence with the new knowledge	Students are divided into 5 groups and given maps of the Priest's Mill area and set of rules. They are introduced with the orienteering game, which is finding locations in a given order and taking photos to prove they were there. Students have to be acquainted with the map and the set of rules – what is allowed and what is forbidden.
5'	BRAIN BREAK	Promote learning	Students discuss the newly acquired information. They can asks questions about the set of rules or the map.
120'	Practice 2 and Production	Orienteering Game – finding locations and improving abilities of using a map. Allow students to test their understanding	Students must find challenging locations, marked on the map, using various ways. Each location is like a checkpoint with administrators who tell them a short story about the location or the building and ask them questions. Students have to listen to the text very carefully to discover an answer for a question. Then administrators give them tasks to do. Each time a group of students are successful, they move on to a different variation using the given map.
20'	Production	Allow students to retrieve what they have learnt and apply their knowledge critically	Students comment on the activity. They should say positive and negative comments. They talk about using knowledge of map features to establish where the locations are located, how to identify the area they were aiming for, locating a terrain feature around them and matching it with the one on the map and figuring out where they needed to go. Students are asked questions like: what was the hardest part of this activity and why?; what was the most challenging about using a map?; what tasks were the most challenging?; how did they memorize locations? would you prefer working individually or in a team?

Homework Suggestions

1. Ask students to find different area, select locations and prepare their own orienteering game.
2. Ask students to prepare guidance for participants who are less progressing and have problems during the game.
3. Ask students to prepare constructive feedback on team work and team collaboration. Students have to list criteria of this feedback.

LESSON PLAN

SCIENCE
PHYSICS/ENGLISH
"Determining specific heat using an electric kettle"

LEVEL: B2

CLASS SIZE: 20 students

AIMS/ INTENDED LEARNING OUTCOME: By the end of the lesson, students will be able to analyze the process of heating up water and determine the specific heat of water using an electric kettle and a formula. Students will plan and conduct the experiment, measure the mass of water at the beginning and in the end of the observation as well as look into the causes of uncertainty presented during the process of calculating the specific heat.
MATERIALS: PowerPoint presentation, electric kettle, water, scale, stopwatch, pen, paper, interactive smartboard for demonstration.

TIME: 45 minutes

AUTHOR: Wioletta Kobędza

TIME/ INTER	STAGE	AIM	PROCEDURE
5'	Warm up + Presentation	Check Students' knowledge and introduction to the topic.	Students are introduced to the concept of specific heat and how it's determined. Students watch the presentation and learn how to conduct an experiment using data they gather.
5'	BRAIN BREAK	Promote learning.	Students try to remember and revise everything they have just learned.
20'	Practice 1	Specific heat of water – acquaint students with tasks.	Students are divided into 4 groups of five people. They are given all the needed equipment for the experiments. They set the equipment and proceed with the experiment.
15'	Practice 2	Learning process. Give students more autonomy. Allow students to test their understanding.	Students work together to learn how to use the formula for specific heat. They make use of measurements to solve the equation for the end result.
5'	BRAIN BREAK	Promote learning.	Students discuss the newly acquired information. They have to discuss if their new knowledge is difficult or not.
10'	Production	Specific heat of water – comparing results.	Students evaluate the results of the experiment between themselves, compare them to other groups. After comparing, they have to make a table with all the values.

Homework Suggestions

1. Ask students to find out what other formulas they can use to solve this experiment.
2. Ask students to make their own experiment using this formula and to make a presentation based on it.

Agrupamento de Escolas de Rio Tinto

RIO TINTO, PORTUGAL

ORGANISATION ID: **E10125717**

LESSON PLAN

SCIENCE
BIOLOGY/ ENGLISH/CITIZENSHIP AND DEVELOPMENT
"Food Pyramid and Healthy Eating Habits"

LEVEL: 13-14 years old

CLASS SIZE: 30 students

AIMS/ INTENDED LEARNING OUTCOME: :
- Analyse the Food Pyramid and compare it with their own habits.
- Identify habits of healthy eating.
- Classify their eating habits as healthy or unhealthy.

MATERIALS: Paper, colored papers, pencils in color, liquid paints, sheets of paper and crayons, laptop

TIME: 90 minutes

AUTHOR: Marina Rebelo

TIME/ INTER	STAGE	AIM	PROCEDURE
5'	Warm up + Presentation	Check Students' previous knowledge	1-Introduce the food vocabulary: vegetables, carbohydrates, protein, fruit, dairy products, fats, oil, sweets, bread, rice, pasta, cereal, tomatoes, corn, carrots, pears, bananas, strawberries, milk, yoghurt, cheese, beef, fish, chicken, pork, chocolate chips, cakes, candies, water.
5’	BRAIN REAK	Promote learning	2- Make use of real photographs and/or interactive flashcards to show the images and the word, and have them repeat after you. Then they can make sentences with some of the words, first individually, then in groups, then they report their sentences to the whole class. You could also play a game in which they divide themselves in two groups, you say the vocabulary and they need to run and grab the flashcard that matches with the vocab.
10'	Presentation	Present vocabulary about the Scientific	3- Introduce the idea of a Food Pyramid. Do not show one as they are going to research and look for one. But show them an image of a pyramid or maybe a triangle, and explain the logic behind: a structure used to show the suggested right amount of servings that should be eaten a day, for each food category.
10'	Practice 1	Draw your own Food Pyramid	4- Draw your own Food Pyramid, based on your eating habits, or project one already made prior to the class. At this time explain the food categories. Ask them if your own eating habits are healthy or unhealthy and why, but do not give them the answer, just let them reflect upon it.
15	Practice 2	Give students more autonomy	5- Tell each of them to draw their own food pyramid, individually. They can use the words given plus any other food vocabulary already acquired. Give them sheets of paper and crayons.
10'	Production	Promote Awareness Raising and Critical Thinking	6 - Next they get in groups and compare their pyramids. They will have to decide if each of them is healthy or unhealthy, and either choose the healthiest one or make a compilation of them and have one pyramid that is the agreed healthiest food pyramid possible from the group.
5’	BRAIN REAK	Promote learning	7 - Collect the pyramids built in the groups
15’	Production	Give students more autonomy	8- Tell them now to look for the correct food pyramid and present it to class. They can look for it in the internet, at the library or anywhere else. Have them show the food pyramids they found and brought to class.
15'	Production	Allow students to retrieve what they’ve learned and apply this knowledge	9 - Same groups, give them back the food pyramids they have built last class, then have them make a comparison between the two pyramids and get into a final verdict: are their food pyramids healthy or unhealthy and why.

Homework Suggestions

As a follow-up tell them they should think on how they can make their own food pyramids as healthy as possible, eating whatever they’ve already been eating, maybe adding one or another serving or even another type of food if they wish or accept to change their eating habits.

LESSON PLAN

SCIENCE
BIOLOGY/ ENGLISH/CITIZENSHIP AND DEVELOPMENT
"Plastic, Plastic Everywhere"

LEVEL: 13-17 years old

CLASS SIZE: 30 students

AIMS/ INTENDED LEARNING OUTCOME: :

- Students will analyse the history of plastics, their effects on the environment and regulatory efforts to address those effects.
- Students will evaluate the role of microplastics in their lives and reflect on their willingness to change their behaviours to help reduce plastic pollution or if regulation should play a role.

MATERIALS: Paper, laptop, phone

TIME: 50+50 minutes

AUTHOR: Marina Rebelo

TIME/ INTER	STAGE	AIM	PROCEDURE
5'	Warm up + Presentation	Check Students' previous knowledge	Plastics are a huge part of our everyday lives. Many of the products we use are made out of or contain plastics. What do you know about what happens to plastics after they are disposed of? How do they affect the environment? A quick write allows students to write down their thoughts before discussing the opening question in order to increase participation and make the discussion more accessible to English Language Learners
5'	Motivation	Discuss the quick-write prompt as a class.	What do students know about what happens to plastics after they are disposed of and how they affect the environment? Ask if anyone has an example about how they changed their behavior or stopped using any plastic items because of something they learned about plastics and the environment.
10'	Practice 1	Present vocabulary about the Scientific	Have students individually or in pairs read https://www.kqed.org/lowdown/29456/how-plastics-took-over-the-world-and-created-an-environmental-mess-a-brief-disposable-history https://wp.me/p681tQ-7F6 and the interactive timeline about how plastics came to be so ubiquitous, the damage they've caused to the environment and regulatory efforts to control their negative impacts
5'	BRAIN BREAK	Promote learning Allow students to retrieve what they've learned and apply this knowledge	Ask students to choose the entry on the timeline that was most interesting to them. Place students in groups of 2 or 3 to share with each other why that entry stood out to them.
15	Practice 2	Promote Awareness Raising and Critical Thinking.	Have students watch the Is Your Fleece Jacket Polluting The Oceans? https://youtu.be/toU15Q9MAWQ a class. • Stop the video at :53 and study the graphics: What do they mean? (Note: MT stands for metric tons) • Stop at 1:20: Review what microfibers are and where they come from. • Stop at 1:44 and ask: What are microplastics and where do they come from? • Stop at 2:03: Discuss why plastics (and microfibers) don't break down completely. • Stop at 3:07 and ask: How do microfibers affect marine life? • Stop at 4:41 and ask: What are some ways that microfiber pollution could be prevented through regulation? Make a list of the ideas that were presented. • Stop at 5:15 and ask: How could bacteria play a role in reducing microfiber pollution? • Stop at 5:31 and ask: What are some ways that individuals could help prevent microfiber pollution?
10'	Prodution	Apply their knowledge	Ask students what most surprised them from the ***Is Your Fleece Jacket Polluting The Oceans?*** https://youtu.be/toU15Q9MAWQ In pairs, have students take turns sharing their thoughts and concerns about microfiber pollution by answering the following questions: "What did you learn? What concerns you most about microfiber pollution?"

<table>
<tr><th>TIME/ INTER</th><th>STAGE</th><th>AIM</th><th>PROCEDURE</th></tr>
<tr><td>20’</td><td>Practice 3</td><td>Apply their knowledge critically</td><td>TasK: “Identification of microplastics in hygiene products”
Use the app beat the microbead
-Each member of the class or small group can search for at least 4 products.
- Analyze some diversified products (gels, creams, toothpastes…).
- Verification of the composition of the product using the label.
- Material needed: table made by the class in checklist format to fill in various products; reference list of microsphere component names.
<table>
<tr><th>BRAND</th><th>PRODUCT TYPE</th><th>PRODUCT NAME</th><th>MICROPLASTICS</th></tr>
<tr><td>Ex.</td><td>for hair</td><td>hair conditioner</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
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<tr><td>30’</td><td>Reflection</td><td>Promote Awareness Raising and Critical Thinking.</td><td>Tell students they will have a chance to share their concerns about microfibers in the forum https://www.tricider.com/home
Individually or in small groups, students post responses in the comments section answering the following question:
Now that you know more about plastics and microfibers, is there anything you’re willing to do in your daily life to help reduce microfiber pollution? Do you think regulation should play more of a role? How? https://www.tricider.com/admin/3TXm6irfbnR/BKJEhwQ4xp3
• Responses should be supported by evidence from the Above the Noise episode, The Lowdown post, or other research on the topic. (See source list)
• Encourage students to reply to other comments after posting their response. Remind them to use evidence to support their claims and respectful language when replying to others.</td></tr>
</table>

Homework Suggestions

Write/speak locally: Students turn their response to this issue into a letter, short speech or presentation, then research ways to make their voice heard in their community. (Example: Speaking during the public comment section of a city council meeting, posting in an online forum, etc.)

LESSON PLAN

SCIENCE
GEOGRAPHY / MATHS / ENGLISH
"Geometry & Geocaching Using Google Earth (GIS) & GPS"

LEVEL: 13-17 years old

CLASS SIZE: 30 students

AIMS/ INTENDED LEARNING OUTCOME:

- Use GPS technology to locate points with latitude and longitude to determine locations on Earth and store these points digitally by transferring latitude and longitude data from a GPS to GIS (Google Earth).
- Solve problems involving scaled drawings of geometric figures, including calculating the actual lengths and areas of a scaled drawing and using appropriate tools, such as a protractor.
- Explain how GPS and GIS relate to engineering.
- Solve problems related to angle measurements and angular relationships, such as complementary, supplementary and triangle and quadrilateral angular relationships.

MATERIALS: this activity requires the resource(s): https://www.google.com/earth/
GPS-enabled device (most smartphones are equipped with GPS receivers), computer or another device with an internet connection and installed Google Earth software, booklet, ruler

TIME: 180 minutes

AUTHOR: Marina Rebelo

TIME/ INTER	STAGE	AIM	PROCEDURE
10'	Warm up + Presentation	Check Students' knowledge and introduction to the topic and objective	1-Hand out the Activity Sheet, and organize students into groups for the activity. 2.- Review the challenge/activity instructions. "Your group will be given a latitude and longitude, also known as GPS coordinates, showing the location of a geocache. The geocache will contain hints (in the form of geometry problems) as to the location of another one of the geocaches in your field. When you find a new geocache, you must save the GPS coordinates on your GPS device as a waypoint. A waypoint is simply a marker on a GPS map which records data such as the GPS coordinates, elevation, and time of day. Objective(s): - Use GPS technology to locate points given a latitude and longitude to determine locations on Earth and store those points digitally by transferring latitude and longitude data from a GPS'enabled device to Google Earth. - Solve problems related to angle measurements and angle relationships, such as complementary and supplementary angles, and triangle and quadrilateral angle relations."
5'	BRAIN BREAK	Promote learning	We will go over the activity as a class to make sure you understand everything that is being asked of you, and there are written instructions here.
40	Practice 1 Production	Improving ability of implementing the concepts and their relations. Allow students to test their understanding.	To start the activity, students need to know and create a waypoint (latitude and longitude) to insert into their GPS device. How to use waypoints in Google Earth. How to get data from waypoints in Google Earth. The "Get Info" dialogue box in Google Earth.
5'	BRAIN BREAK	Promote learning	We will go over the activity as a class to make sure you understand everything that is being asked of you, and there are written instructions here.
30´	Practice 2 Production	Improving ability of implementing the concepts and their relations. Allow students to test their understanding.	. Log your location on the handout using latitude and longitude. . Answer two geometry questions to determine how far and in what direction you need to travel to find your next geocache. Each geocache has two geometry questions located inside. One will have an answer that is an angle measurement. This is the angle on your compass (the bearing) that you will travel to find your next geocache. The other answer will result in a distance, in meters. This is the distance you will travel to find the next geocache. Complementary and supplementary angles, polygon areas to move from one geocache to another, you can for example 1. Two angles are complementary. What is the sum of the measures of their angles? 2. The area of a rectangle is 405 meters. The width of the rectangle is 3 meters. What is its length? The answers to these questions (90 degrees and 135 meters, respectively) tell students how far how far and in what direction they should walk to the next geocache.
5'	BRAIN BREAK	Promote learning	We will go over the activity as a class to make sure you understand everything that is being asked of you.
90'	Practice 3 Production	Navigating the Geocaches. Allow students to retrieve what they have learnt and apply their knowledge critically	1-Direct students towards the latitude and longitude for their first geocache and navigate to new geocaches and GPS coordinates by solving math problems. Each student needs a pencil to work out the problems in the field. Each group starts at different locations, which will be Geocache 1 in their handouts. 2- Hand out to each group the papers "Group Members Latitude and Longitude Log" with the latitude and longitude of the geocaches. 3. Direct students to copy down the latitude and longitude Geocache 1 in their student handout sheets. Direct students to look at the geocache locations in the handout and solve the two geometry problems located within each geocache. Space is provided to work out each problem. One answer tells the team what direction, such as an angle or compass bearing, to walk to find the next geocache, and the other answer provides the distance to travel in meters. Remind students any errors will keep them from finding the next geocache, so be mindful! 4. Once a group finds the next hidden geocache location, they make a new waypoint in the GPS device and copy the geocache name as well as its latitude and longitude into the worksheet. 5. Teams know they have finished when they arrive back at the location where they started.

Homework Suggestions

1. Any variety of extensions are possible, from creating different polygons to construction of different pathways.
2. Have teams create digital slide shows to present to the class.

LESSON PLAN

SCIENCE
MATHEMATICS/ ENGLISH

"Floor plan: reducing and enlarging"

LEVEL: 13-17 years old

CLASS SIZE: 30 students

AIMS/ INTENDED LEARNING OUTCOME: : After this lesson, students should be able to:

- Explain how the perimeters and areas of shapes change when they are enlarged and reduced.
- Enlarge or reduce the sizes of shapes given specific scale factors. Solve problems involving perimeter and area

MATERIALS: worksheets, calculators, rulers and protractors

TIME: 100 minutes

AUTHOR: Marina Rebelo

TIME/ INTER	STAGE	AIM	PROCEDURE
10'	Warm up + Presentation	Check Students' knowledge and introduction to the topic	First, have all students complete the pre-quiz. Then review their results as a class—but do not provide the answers. Choose one of the following answers (A-D) to complete each sentence. Note: The answers may be used more than once or not at all. A. half as large as B. the same size as C. twice as large as D. four times as large as Suppose we double the size of a figure. 1. The general shape of the figure will be _____ the original figure. 2. The lengths of any line segments in the figure will be _____ the segments in the original figure. 3. The perimeter of the image will be _____ the original figure. 4. The area of the image will be _____ the original figure. 5. The angles of the image will be _____ the original figure
5’	BRAIN BREAK	Promote learning	Students try to remember of the concepts of perimeter and area and how to calculate each for basic geometric shapes such as rectangles, circles and triangles. An understanding of enlarging and reducing of geometric figures and the term “scale factor.”
40´	Practice 1 Production	Improving ability of implementing the concepts and their relations. Allow students to test their understanding.	The class is divided into pairs of students and distributed the worksheet along with calculators, rulers and protractors. A worksheet is distributed with a which provides a bedroom floorplan plus reduced and enlarged versions. Students collect data by measuring and recording dimensions of parts of the bedroom design (bedroom-rectangle, door swing-quarter circle, TV-triangle), and then calculating the perimeters and areas, too. They answer the questions that prompt them to notice the mathematical relationships during the scaling process. As you measure different parts of the bedroom plan during the investigation, think about how different design features are changing or not changing. For example, how are the angles changing? How is the area changing? How is the room changing?
5’	BRAIN BREAK	Promote learning	Before discussing the questions as a class, group a couple pairs together to compare answers so all students have something to talk about.
20'	Production2	Allow students to retrieve what they have learnt and apply their knowledge critically	Discussing the questions as a class. Review students’ measurements, calculations and answers to gauge their understanding of the lesson topics. Students comment on the activity. They talk about using knowledge. As a shape is enlarged or reduced, its side lengths or circumference is scaled up or down by the scale factor. The perimeter change is equivalent to the scale factor. In other words, if a figure is enlarged by a factor of 4, the perimeter is increased by 4 times the size. However, the area changes by the square of the scale factor. For example, if a figure is enlarged by a scale factor of 2, the area changes by 4.

Homework Suggestions

Post-Quiz: Administer the five-question, multiple-choice initial to gauge each student’s concluding comprehension of the lesson concepts. The post-quiz covers the same mathematical relationships as the pre-quiz, but with a different scaling factor.

LESSON PLAN

SCIENCE
MATHEMATICS/ ENGLISH

"Investigating the design of boxes"

LEVEL: 13-17 years old

CLASS SIZE: 30 students

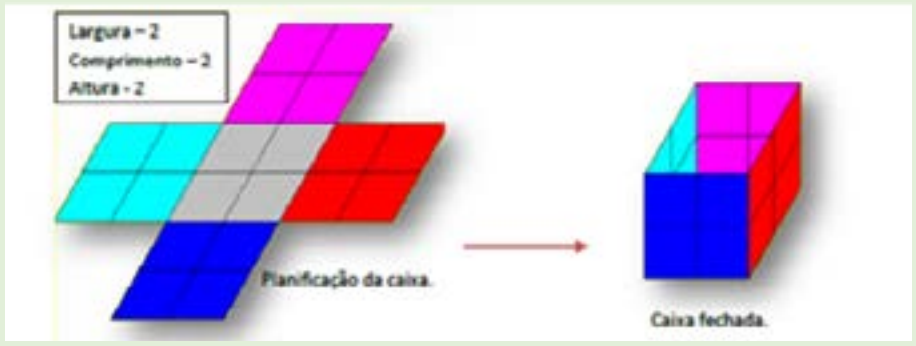
AIMS/ INTENDED LEARNING OUTCOME:

- Solve problems involving the volume of a cube, a parallelepiped, and a cylinder.
- Describing and representing one and two dimensional figures and models of solids, paying attention to their properties and relationships and calculating the volume of straight prisms (cube and parallelepiped).

MATERIALS: Computers, projector, worksheets.
Apllet: http://illuminations.nctm.org/ActivityDetail.aspx?ID=6

TIME: 100 minutes

AUTHOR: Marina Rebelo

TIME/ INTER	STAGE	AIM	PROCEDURE
10'	Warm up + Presentation	Check Students' knowledge and introduction to the topic	It will start with the presentation of a power point with images showing the use of volume in everyday life. Students will be given a paper-based task to solve on the spot, in pairs. The aim of the task is for students to calculate the number of cubes needed to fill boxes with various dimensions of length, width and height. In the first phase the task will be introduced explaining how to work with the interactive application.
5'	BRAIN BREAK	Promote learning	This will be followed by large group discussion of the task and synthesis
20´	Practice 1 Production	Task 1. Identifying the elements of a prism with the support of a digital resource. Improving ability of implementing the concepts and their relations.	This is followed by independent work to familiarize students with the apllet. http://illuminations.nctm.org/ActivityDetail.aspx?ID=6  This is also an opportunity to identify the elements of a solid and relate them to measures (length, width and height). The teacher moves around the groups to motivate, ask questions, clarify doubts.
5'	BRAIN BREAK	Promote learning	This will be followed by large group discussion of the task and synthesis
30'	Practice 2 Production	Task 2. Investigate the volume formula by discovering. Give students more autonomy	Working two by two, they will be able to use the previous applet to make the models for the company. "Imagine you are a box designer at the caramels company Cookies and Company Ltd. This company produces candies and packs them in rectangular boxes with lids, placing 12 per box, to be sold in shops. The company wants you to make all possible types of rectangular boxes that can hold exactly 12 candies, without leaving any space. Then, you should select one of the boxes and recommend it for packing Cookies and Company Ltd. " While the pairs build the boxes and fill them (with the help of the interactive app), the teacher observes what they do and listens to what they say. To try to overcome any stalemates that may arise, the teacher asks the students: What strategies do you use to count the cubes? Do they need to fill up the box to find out how many cubes fit in it? The students then work out all the possible shapes of boxes for 12 caramels: a 12x1x1 box (or 1x12x1 or 1x1x12), a 6x2x1 box (or any other permutation of these numbers), a 4x3x1 box (or any other permutation), and a 3x2x2 box (or any other permutation). Students should fill in the table in the work proposal so they can organize their findings and recognize patterns.
10'	BRAIN BREAK	Promote learning	Discussion of the answers to this question can help lead them to arrive inductively at the formula. Their investigations can lead them to generalize about the volume of any rectangular prism.
10`	Production	Promote Awareness Raising and Critical Thinking	Students are also given a challenge: "The company Cookies and Company Ltd., has asked you to make a presentation in which you show the box model you would recommend. You must also explain the reasons for your choice. "What would you say in that presentation?"

Homework Suggestions

Students could be asked to investigate (design and build boxes without lids), the design of boxes for the same company but now for 18 caramels.

CROATIA

Osnovna škola Višnjevac

VISNJEVAC, CROATIA

ORGANISATION ID: **E10021477**

LESSON PLAN

SCIENCE
GEOGRAPHY/HISTORY/ENGLISH
“Culture by Values”

LEVEL: 13-14 years old

CLASS SIZE: 20 students

AIMS/ INTENDED LEARNING OUTCOME: By the end of the lesson, students will be able to point out the differences and similarities between the cultural characteristics of Turkey and Croatia on the examples of food and common words. Students will be able to value multiculturalism

MATERIALS: Powerpoint presentation, tablets, personal computers or laptops

TIME: 70 minutes

AUTHOR: Mislav Zemljak

TIME/ INTER	STAGE	AIM	PROCEDURE
5' WG	Warm up + sentation	Check Students' previous knowledge	Students will be shown a picture of Suleiman's Bridge over the Drava River, also called the "Eighth Wonder of the World". If none of the students recognizes what is shown, a description of the image will appear. After that, students will be asked if they remember, do the Croatian historical space and the Ottoman Empire, on whose remains today's Turkey was created, have a common episode? If the students cannot remember the Ottoman conquests in the Croatian historical area, the teacher will give them an answer. After that, students will be shown photos of kebabs and sarma and will try to answer the questions: Have they ever eaten these dishes? What are these dishes called? Where did these dishes come from in this area?
3’	BRAIN BREAK	Promote learning	Students try to remember everything they know about Turkey.
5' Ind - PW	Practice 1	Build students confidence with the new vocabulary	Students receive cards of Turkish dishes and lists of ingredients of those dishes, separately. Students try to combine name and recipe. Students then compare their solutions with students sitting near them.
10' GW - WG	Practice 2	Allow students to test their understanding	Students will form groups of five students. Then they try to remember some dish that was not listed in the previous activity. If the students cannot remember on their own, the teacher will help them. Students are then given the task to list the ingredients that go into that dish. After making a list of ingredients, students should underline the spices and ingredients they feel are not from the area where they live. After that, using tablets and the Internet, students should explore where the underlined terms come from.
3’	BRAIN BREAK	Promote learning	Students state what their favorite dish is.
10' Ind - PW	Practice 3	Give students more autonomy	Students will be reminded of some traditional dish from the space where they live. After that they need to write, from the head or with the help of the internet, a recipe. If the dish has any of the ingredients that are of foreign origin, students should underline it. Students answer the questions: Can a foreign ingredient be the result of multiculturalism? Can we conclude how multiculturalism has led to some form of cultural progress?
3’	BRAIN BREAK	Promote learning	Bottle flip contest. Students get a bottle of water and try to flip it.
12’ Ind. – PW – GW – WG	Production	Promote Awareness Raising and Critical Thinking	Students will be given Turkisms used in the Croatian language. Students, if they know, should write an explanation of the term on their own. If students do not know a term, then they must explore the meaning of the terms in groups. After that, students have the obligation to use the Internet to explore some Turkisms that are not listed, and after the research they should be able to explain to the rest of the class and explain what these terms mean. After the activity, the students will, remembering the introductory activity, try to explain where so many Turkisms in the Croatian language come from.
3’	BRAIN BREAK	Promote learning	Ss tell one another the names of actors or athletes who are from Turkey and they are famous.
16’ GW	Production	Apply their knowledge critically	Students are divided into two groups of four students: one who thinks that mixing cultures is good and the other who thinks that mixing cultures is not good. One of the students will be the moderator of the debate. The others will be the audience. Each group needs to come up with 3 arguments to defend their thesis. After presenting the arguments, students should design replicas. After presenting the reply, one of the students from each group should present a conclusion in which he will summarize his views. After the debate, the students from the audience vote on which group, according to the stated arguments, is right according to them.

Homework Suggestions

1. **EXTENSION**: : Ask students to check out how their favorite dish is made. Where does this dish come from?
2. **COLLABORATION**: Ask students to write what multiculturalism is together using social media or online tools such as Google Drive, Dropbox, and other cloud storage options. Each student will write one part of the Abstract (question, method, hypothesis, conclusion)
3. **ACTIVE RETRIEVAL**: Ask students to make flashcards and quiz themselves. Each flashcard should contain one argument for or against the argument and its explanation.
4. **PROJECT-BASED LEARNING**: Long-term commitment. Students will have to write a paper and do a frequent progress check with the teacher. All stages will be planned and discussed with the teacher. At the end of the semester, every group should have a simple sample of a paper about any topic they choose.

LESSON PLAN

SCIENCE
BIOLOGY/PHYSICAL EDUCATION
“Bones & phones”

LEVEL: 14-19 years old

CLASS SIZE: 34 students

AIMS/ INTENDED LEARNING OUTCOME: By the end of the lesson, students will be able to connect the impact of the use of information technology on the structure of the human skeleton and its prevention.

MATERIALS: Instructional worksheets, instructional envelopes, qr codes with internet content, hand bone and muscle model, wooden puzzle sticks, wooden proctractor, scotch tape, markers, A3 paper

TIME: 100 minutes

AUTHOR: Natalija Krešo

TIME/ INTER	STAGE	AIM	PROCEDURE
5' WG	Warm up + Presentation	Check Students' previous knowledge	1. Students solve a worksheet in which they connect bones from the skeleton with individual bones
12' GW - WG	Presentation	Present vocabulary about the Scientific Method: Question, Hypothesis, Experiment, Method, Data Analysis, Results, Conclusion	2. Based on the solution from the first worksheet, they complete the Qr code by coloring it, scan it and open a quiz in which they repeat the roles of bones and skeletons.
3’	BRAIN BREAK	Promote learning	3. Practical work - shake the bones
5' Ind - PW	Practice 1	Build Ss’ confidence with the new vocabulary	4. With the help of a hint, they discover a place with a yellow envelope in which the next task is; Stacking wooden sticks-puzzles, the solution of which reveals the location of the box with the task - a new mission that leads them further through the game.
6' GW - WG	Practice 2	Allow Ss to test their understanding	5. In the box is an unfinished model of the bones and muscles of the arm. According to the instructions, the students complete the model in order to practically test the interaction of bones and muscles (they blow air into the muscle, which then moves the bones of the arm). They comment on the mutual role of bones and muscles within the group.
6' Ind - PW	Practice 3	Give Ss more autonomy	6. After completing the previous task, students take a prepared roll of paper on which the next task is - scanning Qr codes that reveal the meaning of the abbreviation RSI (Repetitive strain injury), its causes, consequences and prevention. The task is to create a mind map or poster that shows the above concepts.
3’	BRAIN BREAK	Promote learning	7. The harmfulness of long-term use of information technology on the skeleton
12’ Ind. – PW – GW – WG	Production	Promote Awareness Raising and Critical Thinking	8. By creating mind maps or posters, students should observe the impact of long-term use of information technology on bone health and prevention in the form of physical activity
3’	BRAIN BREAK	Promote learning	9. Joint learning and discovery of new concepts
14' T-S-S	Production	Allow Ss to retrieve what they’ve learned and apply this knowledge	10. The completed poster / mind map is the key to the last step in completing the entire task. Based on the specified key, the students receive a green envelope with the last task - performing stretching exercises that help preserve the health of the skeleton during long-term use of information resources.
3’	BRAIN BREAK	Promote learning	11. Proper joint exercise leads to health
18’ GW	Production	Apply their knowledge critically	12. Each student in the group chooses one of the exercises for the neck, shoulders, back, fingers and seated stretching exercises. He presents to other members who repeat the exercise. When all the members have done the task, the physical education teacher indicates with a sign that the group's task has been successfully completed. Students can leave the classroom, ending the escape room game.

Homework Suggestions

1. **EXTENSION**: Find additional ways to prevent RSI on Internet
2. **COLLABORATION**: Ask students to write an Abstract together – each of them will write one part of the Abstract (question, method, hypothesis, conclusion)
3. **ACTIVE RETRIEVAL**: Students can independently explore the methods in which they show the connection between bones and muscles - design their own model, find a short video on the topic.
4. **PROJECT-BASED LEARNING**: Long-term commitment. Students will check their knowledge over a longer period using short quizzes, which will give the teacher insight into the amount of knowledge acquired, which parts are more or less mastered

LESSON PLAN

SCIENCE
MATH / ARTS/ ENGLISH
"The beauty of symmetry"

LEVEL: 13-14 years old

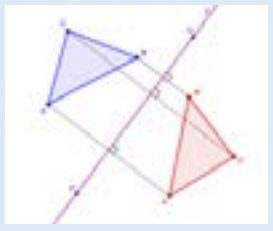
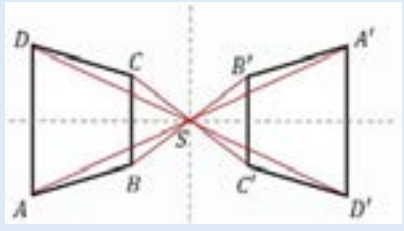
CLASS SIZE: 60 students

AIMS/ INTENDED LEARNING OUTCOME: By the end of the lesson Students (Ss) will be able to recognize symmetry, students will be able to recognize symmetry and apply it in their everyday life and name it in terms of whether it is axial or central. Students will be able to construct axisymmetric and centrosymmetric images and they will be able to make some interesting pictures or patterns using the axial or central symmetry of the coordinate plane

MATERIALS: paper, geometric accessories (triangle ruler, rulers, compasses, protractors), colored paper, color pencils, watercolors, laptop

TIME: 90 minutes

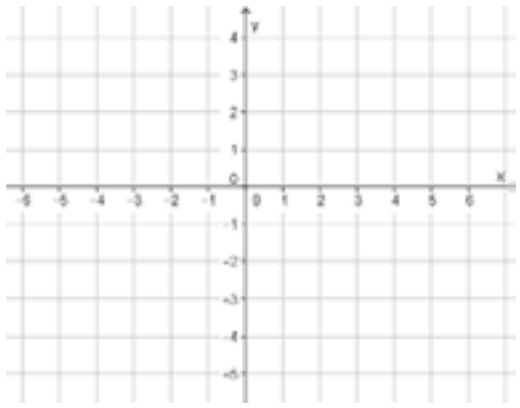
AUTHOR: Mirjana Bagarić

TIME/ INTER	STAGE	AIM	PROCEDURE
5'	Warm up + Presentation	Check Students' previous knowledge	1. Show a presentation with pictures where students will recognize the type of symmetry - axial or central. Repeat/define with students what they already know about these symmetries. In addition to geometric drawings, photographs from everyday life will be shown - mirroring in nature, for example on water.
12'	Presentation	Present vocabulary about the Scientific Method: Question, Hypothesis, Experiment, Method, Data Analysis, Results, Conclusion	2. Students will work in pairs. They will be given a geometric drawing in which they will have to discover the sequence of steps in the construction of an axisymmetric image. They will do the same with a geometric drawing of central symmetry.   The teacher asks questions to find out if the students correctly detected the construction steps. At the same time the teacher constructs on the board according to given instructions. After that, the students will construct pictures of the given geometric figures by themselves. The teacher checks the students' work, notices mistakes and corrects them.
3'	BRAIN BREAK	Promote learning	3. Show some final work. Let students analyze that work.
8'	Practice 1	Mathematic – new vocabulary Task 1. Draw the image of the point with axial symmetry and then also with central symmetry.	4. Tell the students to follow the steps on the board. Students (ss) should be constructed with geometric accessories. Ss should repeat the construction at least twice changing the position of the point, line as axis of symmetry and point as center of symmetry. Ss should do it on different types of paper (white paper and graph paper). Ask them to compare their work and allow them to discuss any divergences for a couple of minutes. Correct if it is necessary.
10'	Practice 2	Task 2. Draw the image of length and then a triangle with axial symmetry and then central symmetry	5. The same as previous.
10'	Practice 3	Give students more autonomy	6. Ask them to use axial or central symmetry and construct images of different geometrical shapes. They can use color pencils as well.
3'	BRAIN BREAK	Promote learning	7. Let's play human mirrors! Students are divided in pairs. What one person does, the other will mirror in the same way (the movements of the first student).
15'	Production	Promote Awareness Raising and Critical Thinking	8. Show students the Rorschach blots. Ask them how they are made. What method was used to obtain it? Tell students to make their own Rorschach stain. Encourage them to use as many colors as possible. They can make these blots with color paper (cutting paper and gluing pieces on some clean paper) or watercolors. 

TIME/ INTER	STAGE	AIM	PROCEDURE
3’	BRAIN BREAK	Promote learning	9. Make an exhibition of students' works.
20'	Production	Allow students to retrieve what they’ve learned and apply this knowledge	10. Students repeat what they have learned and then apply what they have learned using the computer. They can use a dynamic geometry program such as Geogebra and draw digital axisymmetric and centrosymmetric images. They can also use a photo editing program like Photoshop and create "symmetries in nature".

Homework Suggestions

Task 1. Construct an axisymmetric image of a geometric figure in the coordinate plane. Place the geometric figure in one of the quadrants, while the axes of symmetry are coordinate axes. Read the coordinates of the points of those figures and find out if there are any regularities.



Task 2. Do the same as before, but now let the origin (0, 0) of the coordinate plane be the center of symmetry and construct a centrosymmetric image of the geometric figure.

LESSON PLAN

SCIENCE
PHYSICAL EDUCATION/ ENGLISH
“Let’s play ball and learn!”

LEVEL: 6th grade (12 years old)

CLASS SIZE: 24 students

AIMS/ INTENDED LEARNING OUTCOME: : By the end of the lesson Students (Ss) will understand some of the rules of playing basketball. They will also learn how to give or understand the instructions given in English.

MATERIALS: basketballs, cones, flash cards, hoops

TIME: 45 minutes

AUTHOR: Doroteja Vojedilov

TIME/ INTER	STAGE	AIM	PROCEDURE
3' WG	Warm up + Presentation	Check Students' previous knowledge	1 Ss make a circle and play Hot potato – a small ball goes around and when the music stops, the S who is holding the ball needs to do something the T says (using *TPR): turn around, run, touch the ground, stretch, play football/ basketball/handball/ice-hockey, ride a bike, roller-skate, climb a tree, swim…
5' WG	Presentation	Present vocabulary	2 T presents new vocabulary by means of the game Simon says. Ss should do what the T says only when they hear "Simon says". If the T does not say that, Ss should not do anything, just stand still. New vocabulary includes terms connected to basketball: run, bounce, turn, jump, pass, catch, throw, shoot, score.
5' PW	Practice 1	Build Ss' confidence with the new vocabulary	3 Ss work in pairs. Each pair has a ball. Ss tell each other what to do (Ss can use cards with instructions and pictures so they can check if they are doing everything correctly), e.g. Bounce the ball. Shoot the ball. Catch the ball.
3'	BRAIN BREAK	Reducing stress, focusing on the next activity	4 Ss sit quietly, with their eyes closed. T rings the bell and tells Ss to raise their right arm when they no longer hear the sound. When all Ss do that, T instructs them to move the hand to the stomach and feel the breathing. T helps them by saying: Breathe in, breathe out.
8' GW	Practice 2	Allow Ss to test their understanding	5 T and Ss make a training ground by means of cones in order to practice basketball. Ss are divided in two groups, each group has a representative who reads instructions, e.g. Bounce the ball around the cones, run to the basket and score. OR Run next to the cones, pass the ball to your classmate and score at the end. If a student does not understand some instruction, another student shows what should be done, they do not use their own language, only English.
6' GW	Practice 3	Promote Awareness Raising and Critical Thinking	6 Ss take the place anywhere in the court, they are divided in two teams. One team starts passing the ball to another student from the same team. When they do 5 passes, they shout "Point!" The next team gets the ball and tries to do 5 passes. It is not allowed to give the ball to the same student who they got the ball from.
7' GW	Production	Give Ss more autonomy	7 Ss divide in 6 teams and stand in the circle (in the center) of the court. Each team face one of the hoops. The first person in the line gets the ball and, on the signal, they run to the hoop, score and go back to their team, pass the ball to the next person and go to the back of the line. The person can run back to the team only after they score a point. For each point, they shout the number: "One!", "Two!" After 5 minutes the game stops and teams say the number of the points.
6' T-S-S	Production	Allow Ss to retrieve what they've learned and apply this knowledge	8 T asks Ss to say what they liked most about this lesson. If they are not sure how to say it in English, they can show it by miming and other students can help with English. T gives Ss the opportunity to give suggestions for the future similar lessons.
2'	BRAIN BREAK	Calming down after physical activities	9 Ss walk around, go to each other and say something nice to other students: Well done! Good job! It was great to have you in the team! You were great! Have a nice day!

Homework Suggestions

- find an interesting game for the next PE lesson and learn how you will explain it in English to your classmates

**TPR – total physical response*

LESSON PLAN

SCIENCE
PHYSICS/ENGLISH
"How dense am I?"

LEVEL: 13-14 years old

CLASS SIZE: 60 students

AIMS/ INTENDED LEARNING OUTCOME: : By the end of the lesson, students will be able to better apply scientific methods in researching the density of matter, applying what they have learned in practical tasks

MATERIALS: laptop, scale, weights, measuring cup, liquids (water, oil, milk), sugar, flour, bodies of different substances but equal masses, substances of different masses but equal volumes, a larger container filled with water and bodies of different substances (styrofoam, cork , stone, wax, plasticine, metals)

TIME: 90 minutes

AUTHOR: Mirjana Bagarić

<table>
<tr><th>TIME/ INTER</th><th>STAGE</th><th>AIM</th><th>PROCEDURE</th></tr>
<tr><td>5'
WG</td><td>Warm up + Presentation</td><td>Check Students' previous knowledge</td><td>1. Show the presentation with motivational questions like:
Why do oil, cork and ice float on the water? How much space does an iron ball of 1 kg take in comparison to feathers that weigh 1 kg? Will the scale show the same if we put 1 dm^3 of gold and 1 dm^3 of water or wood on it?
Ask the following question: what does population density mean.
Revise what the materials are made of (materials are made of particles - molecules and atoms)</td></tr>
<tr><td>15'
GW - WG</td><td>Presentation</td><td>Present vocabulary about the Scientific Method: Question, Hypothesis, Experiment, Method, Data Analysis, Results, Conclusion</td><td>2. Do an experiment using three objects of the same material, but of different mass and volume. Measure the masses of these objects using the scale, and Archimedes principle for volume (pour water into the measuring cylinder, read volume of water, immerse the object into water, read the new volume of water and the object, calculate the difference between the two volumes).
Complete the table with the data.
<table>
<tr><th>MASS</th><th>VOLUME</th><th>QUOTIENT OF MASS AND VOLUME</th></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
</table>
Calculate the quotient of mass and volume. Note the regularity in the third column of the table - the values are the same or nearly the same.
Define density of materials as the ratio of mass and volume. Write down the formula for density.
Define the measurement unit for density, kg/m^3, and explain its meaning, e.g. if density is 1000 kg/m^3 it means that the object whose volume is 1 m^3 has mass of 1000 kg.</td></tr>
<tr><td>3’</td><td>BRAIN BREAK</td><td>Promote learning</td><td>3. Watch the video about Archimedes and the crown of the king Hiero.</td></tr>
<tr><td>8'
Ind - PW</td><td>Practice 1</td><td>Build Ss’ confidence with the new vocabulary</td><td>4. Divide students in pairs. Each pair gets one wooden cuboid. The wooden objects are made of different wood (oak, poplar, fir, beech), have different volume and tijela. Students measure the volume of the cuboid and its mass, using the scale. They calculate density.</td></tr>
<tr><td>8'
GW - WG</td><td>Practice 2</td><td>Allow Ss to test their understanding</td><td>5 Students compare their results for density with other groups. The pairs that have the same density values group together. They comment on their results. If their results are not completely the same, although they have the same type of wood, but the objects have different mass and volume, they try to find possible reasons for that, e.g. accuracy in measuring. They calculate the mean value.</td></tr>
<tr><td>8'
Ind - PW</td><td>Practice 3</td><td>Give Ss more autonomy</td><td>6 Students are divided in pairs. They measure the volume of an irregular object. They measure the volume several times and calculate the mean value. They measure the mass of the object and calculate the density.</td></tr>
<tr><td>3’</td><td>BRAIN BREAK</td><td>Promote learning</td><td>7 Encourage students to think about determining air density in the classroom.</td></tr>
<tr><td>10’
Ind. – PW – GW – WG</td><td>Production</td><td>Promote Awareness Raising and Critical Thinking</td><td>8 Students analyze the table which contains densities of different materials - solids, liquids, gasses. Ask the question: how will these materials act when we immerse them into the water.
Students do an experiment: they put the objects into water and by means of the experiment they use critical thinking and come to a conclusion. The objects that have a higher density than water will sink, the objects of a lower density will float.</td></tr>
</table>

TIME/ INTER	STAGE	AIM	PROCEDURE
3’	BRAIN BREAK	Promote learning	9 Encourage students to discuss the density of vacuum.
18' T-S-S	Production	Allow Ss to retrieve what they’ve learned and apply this knowledge	10 Prepare conceptual and numerical tasks which will help students practice what they have learned about material density.
3’	BRAIN BREAK	Promote learning	11 Prepare the quiz on material density.
6’	Production	Apply their knowledge critically	12 Watch a video about material structures - materials are made of particles. Ask the question: what is the population density of a country, town, place. Students might give the following answer: the more people there are on 1 km^2, the higher is population density. Students connect the terms population density and material density. Students find the connection between material structure and material density - the more material (particles in material) there is in $1m^3$, the higher is material density.

Homework Suggestions

TASK 1: calculate density of your own body.

ROMANIA

Liceul Teoretic Sfantu Nicolae

GHEORGHENI, ROMANIA

ORGANISATION ID: **E10117366**

LESSON PLAN

SCIENCE
BIOLOGY/LITERATURE
ENGLISH ESL

"The Heart from Different Perspectives"

LEVEL: 14-16 years old

CLASS SIZE: 28 students

AIMS/ INTENDED LEARNING OUTCOME: :

- Students will understand the heart's structure, function, and its relationship to the cardiovascular system through literature and English language arts.
- Students will improve their English language skills by engaging in project-based tasks and rotation stations related to the heart and its function.
-

MATERIALS: Textbooks, articles, videos, diagrams of the heart, station materials, and creative writing supplies

TIME: 100 minutes

AUTHOR: Carmen Ducu

TIME/ INTER	STAGE	AIM	PROCEDURE
10' WG	Warm up + Presentation	Review vocabulary related to heart and to capture students' attention	• Review basic concepts of the heart's structure and function. • Introduce the topic of the heart and its function by displaying a diagram of the heart and asking students to identify its different parts. • Review basic concepts such as the four chambers of the heart, the functions of the arteries and veins, and the role of the cardiovascular system in delivering oxygen and nutrients throughout the body. • Introduce vocabulary related to the heart and its functions, such as "pump", "cardiovascular system", "blood vessels", "blood pressure", and "circulation". Write these words on the board or a handout, and ask students to repeat them after you. Explain their meanings using simple English definitions and examples.
30'	Activity 1	Reading and Analysis develop students' critical thinking skills and literary analysis skills, as well as gain a deeper understanding of the heart's significance in literature and science	• provide students with a text or article about the heart, such as a scientific article or a poem about the heart. • Have students read and analyze the text for content, language, and literary devices. • Instruct students to identify and discuss the main ideas of the text and how they relate to the heart's function. **Example texts:** "The Tell-Tale Heart" by Edgar Allan Poe - a short story that explores the psychological effects of guilt and obsession on the human heart. "Heart of Darkness" by Joseph Conrad - a novel that explores the darkness of the human heart and the effects of colonialism on the psyche. "The Heart: An Analysis of Human and Divine Affectation" by William Harvey - a scientific article that describes the anatomy and physiology of the heart, and how it functions as the center of the circulatory system. By analyzing different types of texts related to the heart, students can develop their critical thinking skills and literary analysis skills, as well as gain a deeper understanding of the heart's significance in literature and science.
10'	Feedback and assessment of the activity	To check students' comprehension and provide support	explain vocabulary, literary notions, etc
20'	Activity 2 Project based task	Promote engagement and collaboration and give students the opportunity to apply their knowledge of the heart's function and structure in a creative and collaborative way, while also practicing their English language skills. To develop their teamwork, problem-solving, and language proficiency skills, as well as deepen their understanding of the importance of heart health.	• Divide students into small groups and assign each group a project-based task related to the heart, such as creating a model of the heart, designing a healthy heart meal plan, or creating a public service announcement about heart disease. • Instruct students to use English to communicate with their group members and to complete their task. • Provide resources, such as diagrams or videos, to support their work. 1. **Model of the Heart:** "How to make a 3D heart model" by Science Toy Maker (https://www.youtube.com/watch?v=6_MKNv2Fk5c) "How to make a heart model with a balloon" by Happy Learning English (https://www.youtube.com/watch?v=qv5QWKrRn5M) 2. **Designing a Healthy Heart Meal Plan:** "What to Eat to Keep Your Heart Healthy" by Healthline (https://www.youtube.com/watch?v=UWg9v7C6UzE) "5 Heart-Healthy Foods to Add to Your Diet" by Mayo Clinic (https://www.youtube.com/watch?v=7TmZsHfV7Pw) 3. **Creating a Public Service Announcement about Heart Disease:** "Heart Disease Symptoms & Warning Signs" by Cleveland Clinic (https://www.youtube.com/watch?v=_-laAfw4yDw) "The Warning Signs of Heart Disease" by American Heart Association (https://www.youtube.com/watch?v=r8AMV7L-3B4)

TIME/ INTER	STAGE	AIM	PROCEDURE
15'	Activity 3 Rotation Stations	Promote engagement and collaboration and give students the opportunity to apply their knowledge of the heart's function and structure in a creative and collaborative way, while also practicing their English language skills. To develop their teamwork, problem-solving, and language proficiency skills, as well as deepen their understanding of the importance of heart health.	• Set up rotation stations around the room with different activities related to the heart, such as examining diagrams of the heart, taking blood pressure readings, or practicing CPR. • Divide students into small groups and have them rotate through the stations. • Encourage students to use English to describe the activities and to communicate with each other.
15'	Presentation conclusion and wrap-up	Develop presentation and communication skills	• Have students share their projects and reflect on what they learned. • Review vocabulary related to the heart and its functions.

Assessment

Observe students' participation and engagement in each activity and provide feedback on their use of English to communicate with their peers. Evaluate their understanding of the heart's function through their responses to reading analysis and project-based tasks. Provide opportunities for students to practise their English skills through conversation, writing, and other language activities outside of the classroom.

Homework suggestions

Choose from:

1. Research a famous person who has suffered from a heart-related disease or ailment. Write a short essay about their experience and how it has impacted their life. Use appropriate vocabulary related to the heart and its functions. Be sure to proofread your work for grammar and spelling errors.
2. Create a heart-healthy meal plan for a week. Include breakfast, lunch, dinner, and snacks. Use your knowledge of the heart's function and the food groups to create a balanced and nutritious plan. Write a short paragraph explaining why each meal is healthy for the heart.
3. Write a creative poem or story about the heart. Use literary devices such as metaphor and personification to describe the heart's function and importance. Try to use English expressions and idioms to make your writing more interesting.
4. Watch a video or documentary about the heart or cardiovascular system. Take notes on important concepts and vocabulary. Write a summary of what you learned and how it relates to the topics covered in class.

LESSON PLAN

SCIENCE
CHEMISTRY / ENGLISH ESL

"Exploring the World of Atoms, Isotopes and Electrons"

LEVEL: 14-15 years old

CLASS SIZE: 25 students

AIMS/ INTENDED LEARNING OUTCOME:

- Students will understand atoms, isotopes, and electrons through project-based tasks and gallery walk activities
- Students will improve their English language skills by communicating and collaborating in English during the project-based tasks and gallery walk activity.
- They will also develop critical thinking and creative skills while exploring the exhibits.

MATERIALS:

- Access to online resources such as videos and articles
- Project materials such as poster boards, markers, and art supplies
- Gallery walk materials such as sticky notes and pens

TIME: 100 minutes

AUTHOR: Carmen Ducu

TIME/ INTER	STAGE	AIM	PROCEDURE
10' WG	Warm up + Presentation	Review vocabulary related to the topic and to capture students' attention	• Review the basic concepts of atoms, isotopes, and electrons. • Introduce vocabulary related to these concepts, such as "atomic number", "isotopes", "valence electrons", etc. • Use visual aids, diagrams, and videos to help students understand these concepts.
30'	Activity1 Flipped Classroom	*Develop students' autonomy in learning*	• Assign a video or article related to atoms, isotopes, or electrons for students to watch or read before class. • In class, have students discuss and analyze the video or article in small groups, using English to communicate. • Provide prompts or questions to guide the discussion and encourage critical thinking. **Possible sources:** Crash Course Chemistry: The Nucleus and Radioactivity (video): https://www.youtube.com/watch?v=0rL-ecK7ivs Khan Academy: Atomic structure (article and videos): https://www.khanacademy.org/science/chemistry/atomic-structure-and-properties TED-Ed: The Surprising Discovery of Neutrons (video and lesson): https://ed.ted.com/lessons/the-surprising-discovery-of-neutrons-chad-orsen
10'	BRAIN BREAK	Promote learning	Play a quiz to check students' understanding of atoms, isotopes, and electrons: What is an atom? Describe its basic structure. What are isotopes? How do they differ from each other? What is an electron? How does it relate to the structure of an atom? What is an ion? How does it form? What is the relationship between the number of protons and electrons in an atom? What is the atomic number? How is it related to the number of protons in an atom? What is the mass number? How is it related to the number of protons and neutrons in an atom? What is the difference between an element and a compound? How do you determine the number of neutrons in an atom? How does the Bohr model of the atom differ from the quantum mechanical model? Note: The difficulty level of the questions can be adjusted based on the students' proficiency level and prior knowledge.
20'	Activity 2 Gallery Walk	Promote engagement and collaboration and give students the opportunity to apply their knowledge in a creative and collaborative way, while also practicing their English language skills. To develop their teamwork, problem-solving, and language proficiency skills, as well as deepen their understanding of the concepts	• Divide students into small groups and assign each group a project-based task related to atoms, isotopes, and electrons, such as creating a model of an atom, designing an isotope chart, or constructing an electron configuration game. • Instruct students to use English to communicate with their group members and to complete their task. • Provide resources, such as diagrams or videos, to support their work." **During the gallery walk activity, students should:** • Observe each group's project carefully and take notes. • Leave feedback and questions on the sticky notes provided. • Use English to communicate their thoughts and questions clearly. • Be respectful and constructive in their feedback and questions. • Engage in discussions with their peers about the different projects and their understanding of the concepts presented.

TIME/ INTER	STAGE	AIM	PROCEDURE
10’	BRAIN BREAK	Promote learning	• Have students share their projects and reflect on what they learned. • Review vocabulary related to newly acquired notions.
15'	Production	Promote Awareness Raising and Critical Thinking	• Summarize the key concepts learned during the lesson. • Provide any necessary feedback to students on their presentations and projects. In the end of the lesson ss will watch a TED video about the electrons: https://www.ted.com/talks/george_zaidan_and_charles_morton_the_uncertain_location_of_electrons. They will have homework based on the video.

Homework Suggestions

Choose from:

1. Research and write a one-page essay about the importance of atoms, isotopes, and electrons in chemistry.
2. After having watched the Ted video, explore and research further about the history of atomic models. Compare and contrast some of the key atomic models that have been proposed over time, starting from Democritus in 400 BC up to modern quantum models. Write a short essay summarising your findings, highlighting the significant changes and advancements in our understanding of atomic structure.

LESSON PLAN

SCIENCE
MATHS/BIOLOGY/ARTS
PHYSICS/ENGLISH

"Sounds..."

LEVEL: 14-16 years old

CLASS SIZE: 28 students

AIMS/ INTENDED LEARNING OUTCOME:

- Students will understand the process of sound production, including how sound waves are generated and propagated, as well as the role of vibrating objects in creating sound.
- Students will comprehend the concept of sound perception, exploring how the human ear detects and interprets sound waves, and how the brain processes this auditory information.
- Students will recognize the practical applications of sound in everyday life, such as in communication, music, and technology, gaining an appreciation for the significance of sound in various contexts.

MATERIALS: laptop, TV (interactive whiteboard), plastic straws, scissors, plastic bags, stones, balloons, soldering gun, colored cards with scientific steps, mobile phones with Physics toolbox and stopwatch, musical instrument cards, spiral game rainbow,

TIME: 100 minutes

AUTHOR: Maria Tamas

TIME/ INTER	STAGE	AIM	PROCEDURE
10' WG	Warm up + Presentation	Using games to capture students' attention	Students are divided into groups and play a game in which they must identify sounds from everyday life. Guess the sound game: https://www.youtube.com/watch?v=n1m4h79JZso
10'	Presentation	Present vocabulary about the Scientific Method: Question, Hypothesis, Experiment, Method, Data Analysis, Results, Conclusion	The scientific method's steps are displayed (pasted on the board). Students in groups pose sound-related questions. The inquiries are written on post-it notes and taped to the phrase "Questions." The questions are divided into numerous areas, such as "how sound is produced," "how sound is perceived," "how sound is propagated," "in what environments sound is propagated," and so on.
3'	BRAIN BREAK	Promote learning	Ss tell one another the names of as many physical phenomena as they can remember.
45'	Practice 1	Biology: „The sound reception" Build Ss' confidence with the new vocabulary Gallery walk -activity	https://www.youtube.com/watch?v=m_9SqIQ0BQQ Watch the movie and determine: -the type and characteristics of sounds -parts of the ear -the path of sound in the ear -place and mode of sound reception In groups of 4 students write the newly acquired information on a flip chart. Gallery walk activity-Each group will design a presenter who is going to present the chart to the others, while the other members of the group will walk around the other groups to find out more infos . Each student will return at the end of all the presentations and add at least one more info to the chart
20'	Practice 2	Mathematical calculation + Sound physics Allow Ss to test their understanding	Choose from a list of sound-related questions. "What is sound?" you might wonder. The Mentimeter application is used to collect words from groups regarding the nature of sound. (https://www.mentimeter.com/) Experiment with the rainbow spiral game to create stationary waves. Two students stretch the spiral, with one beginning to induce oscillations at one end. Standing waves can have one, two, or even three oscillations, depending on the frequency of the oscillations. The length of the wire for the fundamental harmonic is determined to be half the wavelength. The number of oscillations completed per unit time determines the length of the spiral and the frequency of the oscillation. (The stopwatch on the phone is used to keep track of time) Data analysis: The teacher writes the mathematical calculation formula for the standing wave's wavelength and frequency on the board. The theoretically estimated standing wave frequency is compared to the measured values.
10'	Production	Sound production with a variety of frequencies Give Ss more autonomy	Consider questions like: "How does sound is produced?" is the question. Experiment in virtual reality: Use the following application to simulate the wave phenomena and generate sounds of various frequencies: https://www.vascak.cz/data/android/physicsatschool/template.php?f=kvzvuk&l=en Students will work in groups to investigate the use of frequency to modify musical notes and record the sounds that result.
20' Ind - PW	Production	Types of musical instruments. Making musical instruments Give Ss more autonomy Allow Ss to retrieve what they've learned and apply this knowledge	A brief film on the sounds of several musical instruments is shown: https://www.youtube.com/watch?v=17V-bP1XEao Students are given cards with various musical instruments that they must sort into two categories: those that have a soundtrack and those that have sound tubes. Straw is a material that comes in a variety of sizes. The frequencies produced by made equipment are measured using the Physics Toolbox application (on mobile phones). To sing the tune "Gingle bells," each group tries to make four musical notes using whistles. To make a plastic straw whistle, follow these steps: https://www.youtube.com/watch?v=8zrsx8V8XwQ

Homework Suggestions

1. build some more musical instruments
2. find out about the sound reception problems/auditory perception

LESSON PLAN

SCIENCE
PE/ENGLISH
"Learning English by Moving and Playing"

LEVEL: 14-16 years old

CLASS SIZE: 28 students

AIMS/ INTENDED LEARNING OUTCOME:

- Students will improve their English communication skills while participating in a variety of physical activities to develop their overall physical fitness.
- Through playing various games and physical activities, students will practice using English to communicate with their peers while simultaneously improving their physical fitness.

MATERIALS: Cones, balls, music and vocabulary flashcards

TIME: 100 minutes

TIME: Ducu Carmen

TIME/ INTER	STAGE	AIM	PROCEDURE
10' WG	Warm up + Presentation	Review vocabulary related to sports and fitness. to capture students' attention	Review vocabulary related to sports and fitness, such as "exercise", "warm-up", "stretch", "jump", etc. • Use flashcards to introduce new vocabulary. • Have students practice pronouncing and using the words in context through conversation.
30'	Practice 1	Promote movement, collaboration and team work-Basketball Game	• Divide the class into two teams. • Set up cones to create a basketball court. • Have each team take turns trying to score by throwing the ball into the opponent's basket. • Encourage students to use English to communicate with their team members and to describe their actions and strategies.
5'	BREAK	Relaxation and stretching activities	
20'	Practice 2	Promote movement, engagement and fun Fitness Stations	• Set up fitness stations around the room, including activities such as jumping jacks, lunges and push-ups. • Divide students into small groups and have them rotate through the stations. • Encourage students to use English to describe the activities and to encourage their group members. more info to the chart
15'	Practice 3	Promote movement, engagement and fun -Dance Party	• Play upbeat music and have students dance for exercise and fun. • Encourage students to use English to describe the dance moves and to communicate with each other.
10'	Production Conclusion and relaxation activity-English	Review the vocabulary related to sports and fitness:	• Remind students of the vocabulary introduced earlier in the lesson by asking them to recall some of the words and phrases related to physical activity and fitness. • Use flashcards or other visual aids to reinforce the vocabulary and check students' understanding.
10' Ind - PW	Production Conclusion and relaxation activity-PE	By incorporating these additional elements into the cool-down activity, students will not only physically cool down but also mentally relax and reflect on the class. This will help them to be more centered and ready for their next activity or lesson.	1. **Stretching:** • Instruct students to stretch their muscles to cool down their bodies after exercising. • Demonstrate several stretches, such as hamstring stretches or shoulder stretches, and have students follow along. • Encourage students to focus on their breathing while they stretch, taking deep breaths in and out to help relax their muscles. 2. **Breathing Exercises:** • Lead students in a series of breathing exercises to help them calm down and relax. • Ask them to sit or stand quietly and take several slow, deep breaths, inhaling through their nose and exhaling through their mouth. • Encourage them to imagine a peaceful image or to visualize their stress melting away with each exhale. 3. **Reflection:** • After the breathing exercises, give students a few moments to reflect on their physical and mental state. • Ask them to share how they feel and how their bodies and minds have changed since the start of the lesson. • Encourage them to use English to describe their thoughts and feelings.

Assessment

Observe students' participation and engagement in each game and provide feedback on their use of English to communicate with their peers. Evaluate their physical fitness and provide feedback and encouragement for improvement. Provide opportunities for students to practise their English skills through conversation, writing, and other language activities outside of the classroom.

LESSON PLAN

SCIENCE
Biology, Physics, ESL
"Archimedes' Laws and Buoyancy"

LEVEL: 16-18 years old

CLASS SIZE: 25 students

AIMS/ INTENDED LEARNING OUTCOME:
- Students will understand the concepts of water, floating, and Archimedes' laws.
- Students will apply their understanding of these concepts through project-based tasks.
- Students will practice their English language skills through group work and presentations.

MATERIALS:
- Large containers of water
- Various objects that float and sink
- Weighing scales
- Rulers
- Project materials such as construction paper, scissors, glue, markers, etc.

TIME: 100 minutes

AUTHOR: Tamas Maria and Gorgicze Emoke

TIME/ INTER	STAGE	AIM	PROCEDURE
10' WG	Warm up + Presentation	Review vocabulary and concepts related to the topic	• Begin by reviewing the properties of water and the concept of buoyancy. • Introduce Archimedes' principle and how it relates to the buoyancy of objects in water. • Review any necessary vocabulary related to the topic.
20'	Presentation	Experiment with Floating Objects	• Divide students into groups and give each group a container of water, various objects that float and sink, weighing scales, and rulers. • Instruct each group to experiment with the objects, measuring and recording the weight and dimensions of the objects, and whether they float or sink in the water. • Have each group report their findings and discuss the factors that determine whether an object floats or sinks, such as density and buoyancy.
10'	BRAIN BREAK Intermediate feedback and conclusions	To check students' understanding of the concept	Provide a quiz that asks students to explain key concepts related to water, floating, and Archimedes' laws, and to provide examples of how these concepts are applied in real-world situations. **What is Archimedes' principle?** a. The buoyant force on an object is equal to the weight of the displaced fluid. b. The density of an object is equal to its mass divided by its volume. c. The pressure of a fluid increases with depth. **Which of the following is not a factor that affects buoyancy?** a. The weight of the object b. The volume of the object c. The color of the object **What is the relationship between the weight of a floating object and the weight of the fluid it displaces?** a. They are equal. b. The weight of the floating object is greater. c. The weight of the fluid is greater. **Why does an object that is less dense than water float?** a. It is pushed up by the buoyant force. b. It sinks to the bottom. c. It hovers in the middle of the water. **Which of the following materials is most likely to float in water?** a. Iron b. Glass c. Wood *Answers: a, c, a, a, c* This type of assessment can help teachers to identify any areas where students may be struggling and provide targeted support to help them improve their understanding of the concepts.

TIME/ INTER	STAGE	AIM	PROCEDURE
30’	Practice 1 Project-Based Task	Promote engagement and collaboration and give students the opportunity to apply their knowledge in a creative and collaborative way, while also practicing their English language skills. To develop their teamwork, problem-solving, and language proficiency skills, as well as deepen their understanding of the newly learnt concepts	• Divide students into small groups and assign each group a project-based task related to water, floating, and Archimedes' laws, such as creating a boat that floats, designing a water filtration system, or constructing a model of Archimedes' principle in action. • Instruct students to use English to communicate with their group members and to complete their task. • Provide resources, such as diagrams or videos, to support their work. • Have each group present their project to the class in English, explaining their process and their results. Some YouTube resources that students can use to research the project-based tasks related to water, floating, and Archimedes' laws: **1. How to Make a Boat that Floats:** https://www.youtube.com/watch?v=Za_CpZ6l_PQ **2. How to Build a Water Filtration System:** https://www.youtube.com/watch?v=3fkPZjKIoS0 **3. Archimedes' Principle in Action:** https://www.youtube.com/watch?v=txqHWQHtqg8 These videos provide visual demonstrations and step-by-step instructions for each project-based task, which can be helpful for students to understand the concepts and apply them to their own projects.
25’	Practice 2 Presentations conclusions and wrap-up	Develop presentation and communication skills	The properties of water, such as its density and buoyancy. The principle of floating and how it relates to an object's density and buoyancy. Archimedes' principle and how it relates to the buoyant force on an object submerged in a fluid. Through their project-based tasks, students were able to apply these concepts in practical ways and gain a deeper understanding of how they work. As they presented their projects to the class, they were also able to practice their English language skills and receive feedback on their work.
5'	Production	Reflection and Discussion	• Have students reflect on their learning and the skills they developed during the activities. • Facilitate a class discussion on the importance of understanding the properties of water and buoyancy, and how they relate to real-life applications such as boat design and water filtration.

Assessment

Group presentations: Have each group present their project-based task to the class. Through their project-based tasks, students were able to apply these concepts in practical ways and gain a deeper understanding of how they work. As they presented their projects to the class, they were also able to practice their English language skills and receive feedback on their work.

In providing feedback to students on their presentations and projects, it is important to focus on both the content and the language used. Students should be encouraged to use scientific vocabulary related to water, floating, and Archimedes’ laws, and to explain their ideas clearly and effectively. Teachers can provide constructive criticism and suggestions for improvement, while also praising students for their efforts and successes.

Homework Suggestions

Assign a research project where students will explore a real-world application of Archimedes' principle, such as the design of submarines or hot air balloons. Have them present their findings to the class in English.

PBL
Project-Based Learning

TÜRKIYE

Ahmet Hamdi Gökbayrak Fen Lisesi

BURSA, TÜRKIYE

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PROJECT PLAN

SCIENCE
MATHS

Enhancing Key Competencies Through Project-Based Learning

TITLE: BIG BUILDINGS SIMPLE SOLUTIONS

PROJECT IDEA: It is to design a clinometer model in order to measure the heights of large structures and to make measurements using this clinometer and present it in the classroom environmenT.

AUTHOR: Rasit Gecal

TABLE OF SUMMARY	
Subject(s)	Triangles 9.4.2.2.- Evaluates the minimum conditions necessary for two triangles to be similar. 9.4.2.3.- Establishes the relationship between the line segments separated by the line drawn parallel to one side of the triangle and intersecting the other two sides. 9.4.2.4.- Solves problems related to similarity of triangles. 9.4.4.1.- Solves problems by obtaining the Pythagorean theorem in a right triangle. 9.4.4.2.- Solves problems by obtaining Euclidean theorem. 9.4.4.3.- Calculates the trigonometric ratios of acute angles in a right triangle.
Age of students	14-18
Number of students	25
Time frame/duration	WEEK 1: DATA COLLECTION WEEK 2: A TRIP TO GET INFORMATION FROM PROFESSIONAL GROUPS 3. WEEK: DETERMINING THE MATERIAL AND METHOD TO BE USED. WEEK 4: PREPARATION OF MATERIALS AND PRESENTATION. WEEK 5: PRESENTATION
Learning objectives	To make a clinometer to measure the heights of large structures and to make measurements using this clinometer. To establish the relationship between the line segments separated by the line drawn parallel to one side of the triangle and intersecting the other two sides. Solving problems by obtaining the Pythagorean theorem in a right triangle. Calculating the trigonometric ratios of acute angles in a right triangle. SOLVING PROBLEMS REGARDING THE SIMILARITY OF TRIANGLES EXPLAINING THE TRIGONOMETRIC RATIOS OF ACUTE ANGLES IN RIGHT TRIANGLE. PROBLEM SOLVING BY ACHIEVING THE PYTHAGORIC THEOREM IN RECTANGULAR.
Resources and tools	EXCEPT THE ACTUAL MEASURING DEVICES OF THE LENGTH OF HIGH BUILDINGS IS IT POSSIBLE TO MEASURE WITH OTHER TOOLS? WHAT INFORMATION DO WE NEED FOR THIS PROCESS? FROM WHICH SOURCES CAN WE COLLECT INFORMATION? IS THERE ANY STUDY DONE ON THIS TOPIC? WHICH SUBJECT AND TOOLS OF MATHEMATICS CAN WE USE? ARE THERE ANY TOOLS DEVELOPED FOR THIS PROJECT? HOW TIME IS REQUIRED FOR DESIGN? WHEN AND WHERE WILL IT BE EXHIBITED? A group meeting will be held first to gather information. About the topic library and internet research will be done. The structure to be measured is determined and Information about clinometer construction will be collected. will be used for these operations. Mathematics topics will be determined.
Expected results	Information obtained by checking whether the work schedule is followed, and The clinometer model made will be presented as a presentation. Submission of the Project The groups collected the data they collected for the project, the clinometer models they made, the relevant visuals and measurements will be presented in class as a Power Point presentation.
Key competences http://bit.ly/key_competences	Designing a clinometer model to be able to measure heights of large structures and making measurements using this clinometer and presenting them in the classroom environment. Mathematical competence and competence in science, technology and engineering Digital competence Personal, social and learning to learn competence
Other considerations	Determination of Evaluation Criteria and Proficiency Levels WORK DEPARTMENT 5% INFORMATION COLLECTION 20% INFORMATION ORGANIZATION 10% MATERIAL DESIGN 20% REPORT WRITING 15% PRESENTATION AND ON TIME DELIVERY 15% COOPERATION 15% 1. CHECK: IT WILL BE DONE AFTER EXAMINATION OF THE COLLECTED INFORMATION. 2.CONTROL: MATERIAL TO BE USED AND METHODS SELECTED IT WILL BE DONE TO DETERMINE IT'S ACCURACY AND SUITABILITY. 3.CONTROL: EXAMINING THE PREPARATIONS BEFORE PRESENTATION, ITS MISSING IT WILL BE MADE TO FIX THE POINTS.

Procedure

Activities

- Groups of five will be formed.
- A group meeting will be held first to gather information. About the topic
- library and internet research will be done. The structure to be measured is determined and
- Information about clinometer construction will be collected and will be used for these operations.
- Mathematics topics will be determined.
- Information obtained by checking whether the work schedule is followed, and
- The clinometer model made will be presented as a presentation.
- The groups collected the data they collected for the project, the clinometer models they made, the relevant
- visuals and measurements will be presented in class as a Power Point presentation.
- Mathematics Textbooks
- Websites related to the topic
- Chamber of Architects website

Activity	Procedure	Description
1. information Collection		
2. A trip to get information from professional		
3. Determining the material and method to be used		
4. Preparation of materials and presentation		
5. presentation		

Assessment

- Determination of Evaluation Criteria and Proficiency Levels
- WORK DEPARTMENT 5%
- INFORMATION COLLECTION 20%
- INFORMATION ORGANIZATION 10%
- MATERIAL DESIGN 20%
- REPORT WRITING 15%
- PRESENTATION AND ON TIME DELIVERY 15%
- COOPERATION 15%

ACTIVITY 1	
PROCEDURE	A group meeting will be held first to gather information. About the topic library and internet research will be done. The structure to be measured is determined and Information about clinometer construction will be collected. Will be used for these operations. Mathematics topics will be determined.
APPROX. TIME	1 week
LEVEL	Language level A 1+
LEARNING OUTCOME	Information obtained by checking whether the work schedule is followed, and The clinometer model made will be presented as a presentation.
INDICATORS	The groups collected the data they collected for the project, the clinometer models they made, the relevant visuals and measurements will be presented in class as a Power Point presentation.
MATERIALS	Mathematics Textbooks Websites related to the topic Chamber of Architects website

PROJECT PLAN

SCIENCE
PHYSICS

Enhancing Key Competencies Through Project-Based Learning

TITLE: ENERGY OF FUN

PROJECT IDEA: What energy energy and energy transformations are observed in amusement parks and parks? Relate energy mechanical and energy to general examples involving other energies.

AUTHOR: Rasit Gecal

TABLE OF SUMMARY	
Subject(s)	Energy 9.4.2.1.- Analyzes the variables on which translational kinetic energy, gravitational potential energy and elastic potential energy depend. 9.4.3.1.- It deduces that the total energy is conserved in the transformation of energy from one form to another (mechanical, heat, light, sound, etc.). Define energy. Realizing that potential energy and kinetic energy are types of energy. Understanding that mechanical energy is the sum of potential energy and kinetic energy. Recognize that mechanical energy is conserved in frictionless environments. Realizing that mechanical energy is not conserved in frictional environments.
Age of students	14-18
Number of students	25
Time frame/duration	Define energy. Realizing that potential energy and kinetic energy are types of energy. Understanding that mechanical energy is the sum of potential energy and kinetic energy. Recognize that mechanical energy is conserved in frictionless environments. Realizing that mechanical energy is not conserved in frictional environments. To save students from their prejudiced approaches to physics and to make them realize that the events encountered in daily life are directly related to the laws of physics. Motivational questions: Could we slide down the slide without gravity? Does the speed change in the movement of a swing? Where does the swing reach its maximum and minimum velocity values?
Learning objectives	To make a clinometer to measure the heights of large structures and to make measurements using this clinometer. To establish the relationship between the line segments separated by the line drawn parallel to one side of the triangle and intersecting the other two sides. Solving problems by obtaining the Pythagorean theorem in a right triangle. Calculating the trigonometric ratios of acute angles in a right triangle. SOLVING PROBLEMS REGARDING THE SIMILARITY OF TRIANGLES EXPLAINING THE TRIGONOMETRIC RATIOS OF ACUTE ANGLES IN RIGHT TRIANGLE. PROBLEM SOLVING BY ACHIEVING THE PYTHAGORIC THEOREM IN RECTANGULAR.
Resources and tools	Heterogeneous groups of five (groups are formed taking into account the class conditions) are formed in a class of thirty students, taking into account their success levels. 1) Have you ever been to a playground or do any of you bungee jumpers? 2) What energies do we use in our daily life? 3) What kind of energy does a moving vehicle and an apple hanging on a branch have? 4) What kind of energies does an airplane in motion in the air have? 5) How does the potential energy change when the child at the top of the slide starts to slide? 6) Does energy disappear? 7) How do the potential and kinetic energies of the child sliding down the slide change? 8) Why do we slow down over time when swinging on a swing? 9) If there were no friction, would the change in potential energy equal the change in kinetic energy? 10) Why can it be difficult for us to slide down the slide when we wear clothes with different fabrics?
Expected results	Identification of Control Points 1) Data collection. 2) Library and internet browsing 3) Selection of visual material such as pictures and photographs 4) Making a meaningful summary from the report for the presentation Collection of Information 1) To have students do a literature review about the problem. 2) Detection of energy samples from the environment in daily life. Organizing and Reporting Information Scientifically correct information was obtained about the project. The obtained information was supported by visuals. Guidance efforts were made to write the obtained scientific information in their own words. The prepared project was enriched by supporting it with reports, videos and pictures. It was seen that Turkish was used correctly in all the information transferred to the text. The resources used were reflected in the reports

TABLE OF SUMMARY	
Key competences **http://bit.ly/key_competences**	**PROJE DEĞERLENDİRME ÖLÇEĞİ** Projenin Adı: Öğrencinin Adı ve Soyadı: Yaşı:

Gözlenecek Öğrenci Kazanımları	Dereceler				
	Zayıf	Kabul	Orta	İyi	Çok
	1	1	3	4	5
I. PROJE HAZIRLAMA SÜRECİ					
Projenin amacını belirleme					
Projeye uygun çalışma planı yapma					
Grup içinde görev dağılımı yapma					
Belirlenen konunun önemini ortaya koyma					
Proje sonunda ne tür sonuçlara ulaşılacağının belirlenmesi					
TOPLAMI					
II. PROJENİN İÇERİĞİ					
Proje konusunda bilimsel açıdan doğru bilgiler					
Toplanan bilgileri analiz etme					
Elde edilen bilgilerden çıkarımda bulunma					
Yapılan çalışmanın orijinal olması					
Çalışmada eleştirel düşünme becerisini kullanabilme					
Proje raporu, resimler, gazete haberleri, tablo, grafik ve istatistiklerle zenginleştirilmesi					
Metne aktarılan tüm bilgilerde Türkçeyi doğru kullanma					
Yararlanılan kaynakları rapora yansıtma					
TOPLAMI					
III. SUNU YAPMA					
Türkçeyi doğru ve düzgün konuşma					
Sorulara cevap verebilme					
Konuyu izleyicilerin dikkatini çekecek şekilde sunma					
Sunuyu hedefe yönelik materyalle destekleme					
Sunuda akıcı bir dil ve beden dili kullanma					
Verilen sürede sunuyu yapma					
Sunum sırasında özgüvene sahip olma					
Severek sunu yapma					
TOPLAMI					
Öğretmenin yorumu					

Other considerations	Submission of the Project The studies will be conveyed with a powerpoint presentation. Presentation time for each group is 10 minutes. Group spokespersons will make the presentation. One week after the presentation, the written outputs of the presentations will be delivered in the form of a report.

Procedure

Activities

- Heterogeneous groups of five (groups are formed taking into account the class conditions) are formed in a class of thirty students, taking into account their success levels.
- To save students from their prejudiced approaches to physics and to make them realize that the events
- encountered in daily life are directly related to the laws of physics.
- Motivational questions:
- Could we slide down the slide without gravity?
- Does the speed change in the movement of a swing?
- Where does the swing reach its maximum and minimum velocity values?
- 1) To have students do a literature review about the problem.
- 2) Detection of energy samples from the environment in daily life.
- Scientifically correct information was obtained about the project.
- The obtained information was supported by visuals.
- Guidance efforts were made to write the obtained scientific information in their own words.
- The prepared project was enriched by supporting it with reports, videos and pictures.
- It was seen that Turkish was used correctly in all the information transferred to the text.
- The resources used were reflected in the reports.
- The studies will be conveyed with a power point presentation.
- Presentation time for each group is 10 minutes.
- Group spokespersons will make the presentation.
- One week after the presentation, the written outputs of the presentations will be delivered in the form of a report.

Activity	Procedure	Description
1. information Collection		
2. A trip to get information from professional		
3. Determining the material and method to be used		
4. Preparation of materials and presentation		
5. presentation		

ACTIVITY 1	
PROCEDURE	Heterogeneous groups of five (groups are formed taking into account the class conditions) are formed in a class of thirty students, taking into account their success levels. To save students from their prejudiced approaches to physics and to make them realize that the events encountered in daily life are directly related to the laws of physics. Motivational questions: Could we slide down the slide without gravity? Does the speed change in the movement of a swing? Where does the swing reach its maximum and minimum velocity values?
APPROX. TIME	1 week
LEVEL	Language level A 1+
LEARNING OUTCOME	Learning output By checking whether the work schedule is complied with, the information obtained and the work done will be presented.
INDICATORS	The studies will be conveyed with a power point presentation. Presentation time for each group is 10 minutes. Group spokespersons will make the presentation. One week after the presentation, the written outputs of the presentations will be.
MATERIALS	HTTP://WWW.EBA.GOV.TR/EICERIK HTTPS://WWW.SHUTTERSTOCK.COM/TR/ HTTP://WWW.EBA.GOV.TR/EKITAP

Assessment

PROJECT ASSESSMENT SCALE

PROJE DEĞERLENDİRME ÖLÇEĞİ

Projenin Adı:
Öğrencinin Adı ve Soyadı:
Yaşı:

Gözlenecek Öğrenci Kazanımları	Dereceler				
	Zayıf	Kabul	Orta	İyi	Çok
	1	2	3	4	5
I.PROJE HAZIRLAMA SURECİ					
Projenin amacını belirleme					
Projeye uygun çalışma planı yapma					
Grup içinde görev dağılımı yapma					
Belirlenen konunun önemini ortaya koyma					
Proje sonunda ne tür sonuçlara ulaşılacağının belirlenmesi					
TOPLAM					
II. PROJENIN İÇERİĞİ					
Proje konusunda bilimsel açıdan doğru bilgiler					
Toplanan bilgileri analiz etme					
Elde edilen bilgilerden çıkarımda bulunma					
Yapılan çalışmanın orijinal olması					
Çalışmada eleştirel düşünme becerisini kullanabilme					
Proje raporu, resimler, gazete haberleri, tablo, grafik ve istatistiklerle zenginleştirilmesi					
Metne aktarılan tüm bilgilerde Türkçeyi doğru kullanma					
Yararlanılan kaynakları rapora yansıtma					
TOPLAM					
III. SUNU YAPMA					
Türkçeyi doğru ve düzgün konuşma					
Sorulara cevap verebilme					
Konuyu izleyicilerin dikkatini çekecek şekilde sunma					
Sunuyu hedefe yönelik materyalle destekleme					
Sunuda akıcı bir dil ve beden dili kullanma					
Verilen sürede sunuyu yapma					
Sunum sırasında özgüvene sahip olma					
Severek sunu yapma					
TOPLAM					
Öğretmenin yorumu					

ROMANIA

Liceul Teoretic Sfantu Nicolae

GHEORGHENI, ROMANIA

ORGANISATION ID: **E10117366**

PROJECT PLAN

SCIENCE
PHYSICS

Enhancing Key Competencies Through Project-Based Learning

TITLE: STATIC ELECTRICITY

PROJECT IDEA: : Static electricity is a natural phenomenon that we see nearly every day: when we are electrocuted by minor electrical discharges, whenever we see lightning, or when we use various gadgets such as photocopiers or precipitators (filters). The students will research static electricity experimentally and provide a presentation in a foreign language explaining the observed phenomena as part of the completed project. They will acquire scientific, digital, and language skills throughout this method.

AUTHOR: Tamas Maria

TABLE OF SUMMARY	
Subject(s)	Electrification of objects
Age of students	13 years old (VI grade)
Number of students	20
Time frame/duration	2 hours
Learning objectives	Experimental discovery of electrification methods The study of electrical interactions
Resources and tools	Ebonite and glass rods, balloons, aluminium cans (eg glue), cloth, scraps of paper, aluminium foil, thread, paper plates, soap solution, straw, glass cups, glass plate, glasses paper, polystyrene balls, laptops
Expected results	Discovery of electrification methods Description of interactions between electrified bodies Development of language skills in a foreign language
Key competences http://bit.ly/key_competences	Mathematical, science, technology and engineering Digital Multilingual
Other considerations	Students with special educational needs will have personalized worksheets based on their educational needs

Procedure

Activities

- **Ice breaking:** Electric shock (interactive computer game)
  https://phet.colorado.edu/sims/html/john-travoltage/latest/john-travoltage_en.html
  The experimental project's central question is: How can bodies be electrified?

- **Experiments**: students are divided into groups, and friction, influence, and contact are used to identify (discover) electricity (didactic film for experiments: https://www.youtube.com/watch?v=ViZNgU-Yt-Y&list=RDCMUCeQEKFH31vvD-InkTGSvCrA&start_radio=1&rv=ViZNgU-Yt-Y&t=7)

- Students write down what they saw in each experiment:
  1. hover plate,
  2. can can go,
  3. stick about,
  4. bubble difficulty,
  5. dancing balls,
  6. water bender,
  7. balloon flying.

  Electroscope No. 8 9. Wingardium leviosa and creates a PowerPoint presentation with the results of the studies and explanations for what they found.

- Each group gives a presentation to their coworkers about the project, formulating and noting their conclusions

ACTIVITY	PROCEDURE	DESCRIPTION
1. Ice breaking	Students are divided into groups Computer modelling of the phenomenon	Electric charging modelling program opens: https://phet.colorado.edu/sims/html/john-travoltage/latest/john-travoltage_en.html Students discuss similar situations encountered in everyday life.
2. Experimental activity	Experimental film Experimental activity	Students watch the film with electrostatic experiments, choose the experimental materials and repeat the experiment.
3. Description of the experiments	Description of experiments Realization of the project ppt.	Students formulate in writing what they observed and present their PPT projects.
4. Presentation of conclusions in groups	Presentation of experiments and conclusions	Students present their projects and formulate conclusions; in the classroom

ACTIVITY 1	**ICE BREAKING**
PROCEDURE	Students work in groups Computer modeling of the phenomenon
APPROX. TIME	5 min
LEVEL	Language level A 1+
LEARNING OUTCOME	Description of electrical charging phenomena observed in everyday life.
INDICATORS	Correctness of the information provided
MATERIALS	Laptop

ACTIVITY 2	EXPERIMENTAL ACTIVITY
PROCEDURE	Film with experiments Experimental activity
APPROX. TIME	45 min
LEVEL	Language level A 1+
LEARNING OUTCOME	Conducting the experiments
INDICATORS	How to perform experiments, observed technical skills, correct expression in a foreign language
MATERIALS	Ebonite and glass rods, balloons, aluminum cans (eg cola), cloth, scraps of paper, aluminum foil, thread, paper plates, soap solution, straw, glass cups, glass plate, glasses paper, polystyrene balls, laptops

ACTIVITY 3	THE DESCRIPTION OF THE EXPERIMENTS
PROCEDURE	The description of the experiments
APPROX. TIME	30 min
LEVEL	Language level A 1+
LEARNING OUTCOME	Students describe the experiments and make the ppt presentation with pictures / films taken during the experimental activities and with scientific explanations.
INDICATORS	Correct written expression both linguistically and scientifically
MATERIALS	Laptops

ACTIVITY 4	PROJECTS' PRESENTATION
PROCEDURE	Projects' presentation
APPROX. TIME	20 min
LEVEL	Language level A 1+
LEARNING OUTCOME	Students present projects and answer questions from colleagues
INDICATORS	Correct written expression both linguistically and scientifically
MATERIALS	Laptops, interactive whiteboard or TV

Assessment

Students will be assessed using an observation grid in which the accuracy of scientific material, proper expression in a foreign language, team collaboration, project execution, and presentation style will all be considered.

The learning objectives were met if:

• students were able to accurately define the ways of electrification, namely the attraction and repulsion of electricity (from a scientific point of view);

• students correctly constructed and presented the project from a linguistic perspective.

PROJECT PLAN

SCIENCE GEOGRAPHY/HISTORY/TOURISM

Enhancing Key Competencies Through Project-Based Learning

TITLE: DISCOVERING LOCAL HISTORY, GEOGRAPHY, AND TRADITIONS

PROJECT IDEA: Students will gain a deeper understanding of their local history, geography, and traditions through project-based learning tasks.

In this project-based learning lesson, students will explore their local history, geography, and traditions through a series of engaging and interactive tasks. By connecting with the people and places in their community, students will develop a deeper appreciation and understanding of the unique characteristics of their local area.

Through this project, students will develop a range of skills, including research, critical thinking, communication, and teamwork. They will learn to work collaboratively with others to investigate local landmarks, historical events, and cultural practices. Students will also have the opportunity to use technology to document and present their findings in creative and engaging ways.

This project-based learning lesson will not only help students to connect with their local community but also foster a sense of pride and ownership in their surroundings. By the end of the project, students will have gained a deeper understanding of the people, places, and events that have shaped their local area, and how these relate to wider geographical and historical contexts.

AUTHOR: Ducu Carmen

TABLE OF SUMMARY	
Subject(s)	Geography, History, Tourism
Age of students	10-12 grade
Number of students	24
Time frame/duration	2-3 weeks
Learning objectives	• Students will research and analyze the historical events and cultural traditions of their local community. • Students will develop their communication and collaboration skills by working in teams to complete project-based tasks related to their local community. • Students will improve their presentation and public speaking skills by presenting their project findings to the class. • Students will reflect on their own cultural identity and appreciate the diversity within their community through the exploration of local history and traditions.
Resources and tools	Maps, local history books, audio and video recorders, cameras, pencils, pape
Expected results	Students will have a better understanding and appreciation of their local history, geography, and traditions. Students will develop their research and critical thinking skills through project-based learning tasks. Students will gain experience working collaboratively in small groups and presenting their findings to their peers. Students will improve their English language skills through writing, speaking, and presenting their research and findings in English
Key competences http://bit.ly/key_competences	Cultural awareness and sensitivity: Students will gain an understanding of their local culture and traditions, as well as an appreciation for cultural diversity. Critical thinking and problem-solving: Students will be challenged to think critically and creatively as they research and plan their projects, and to come up with innovative solutions to problems they encounter. Communication and collaboration: Students will work in groups and communicate effectively with one another to plan and execute their projects. They will also be encouraged to share their findings and insights with others in the class and community. Research and information literacy: Students will develop research skills and learn how to evaluate and use various sources of information to gather and synthesize data for their projects. Project management and organization: Students will plan and execute their projects within given time frames, manage resources effectively, and present their work in a clear and organized manner.
Other considerations	Provide clear guidelines and expectations for the projects, including deadlines and evaluation criteria. Encourage students to collaborate and work together, but also provide opportunities for individual creativity and expression. Emphasize the importance of cultural sensitivity and respect for local traditions and customs. Consider incorporating community partners or guest speakers to provide additional perspectives and expertise. Provide opportunities for reflection and self-assessment throughout the project, to help students track their progress and identify areas for improvement. Consider using a variety of presentation formats, such as videos, posters, or oral presentations, to accommodate different learning styles and abilities. Provide opportunities for peer feedback and critique, to help students develop their communication and critical thinking skills

Procedure

Activities

ACTIVITY	PROCEDURE	DESCRIPTION
1. Mapping the Local Area	Divide students into small groups and provide them with maps of the local area. Instruct students to mark important landmarks, bodies of water, and other notable features. Ask students to research the history and significance of each marked location and write a brief description of their findings. Students will use English to communicate with their group members and present their findings to the class.	Groups
2. Interviewing Local Community Members	Instruct students to choose a community member with a strong connection to the local area, such as a business owner, historian, or elder. Students will use audio or video recorders to interview the chosen community member about their experiences and knowledge of the local history, geography, and traditions. After the interviews, students will transcribe the recordings and present their findings to the class through written reports or presentations. Students will use English to communicate with their group members and present their findings to the class.	Individually/groups
3. Documenting Local Traditions	Divide students into small groups and assign each group a local tradition to research and document, such as a local festival, culinary tradition, or folk music style. Students will use cameras and audio recorders to document the tradition and interview participants or experts. After the documentation process, students will create a presentation that showcases their findings, including photos, videos, and interviews. Students will use English to communicate with their group members and present their findings to the class	Individually/groups

ACTIVITY	PROCEDURE	DESCRIPTION
4. Creating a Local Tourism Guide	Divide students into small groups and assign each group a section of the local area to create a tourism guide for, such as historical sites, natural landmarks, or cultural experiences. Students will use their research and documentation from the previous activities to create a guide that highlights the unique features and attractions of their assigned section. Students will use English to communicate with their group members and present their tourism guide to the class.	Groups
5. Presentations	Students will present in groups their projects	Groups
6. Assessment	Students will be assessed based on their participation in the group activities, their ability to communicate in English, and the quality of their presentations and projects	Individually

ACTIVITY 1	MAPPING THE LOCAL AREA
PROCEDURE	Divide students into small groups and provide them with maps of the local area. Instruct students to mark important landmarks, bodies of water, and other notable features. Ask students to research the history and significance of each marked location and write a brief description of their findings. Students will use English to communicate with their group members and present their findings to the class.
APPROX. TIME	2 class periods
LEVEL	Language level B1+
LEARNING OUTCOME	Students will be able to identify and describe the geography and landmarks of their local area.
INDICATORS	Students accurately label a map of their local area with major landmarks, bodies of water, and streets. Students describe the physical features of their local area, such as mountains, hills, valleys, and plains. Students identify the location of significant historical events or sites in their local area. Students explain how the geography of their local area has influenced its development and culture.
MATERIALS	Maps, local history books, audio and video recorders, cameras, pencils, paper

ACTIVITY 2	INTERVIEWING LOCAL COMMUNITY MEMBERS
PROCEDURE	Instruct students to choose a community member with a strong connection to the local area, such as a business owner, historian, or elder. Students will use audio or video recorders to interview the chosen community member about their experiences and knowledge of the local history, geography, and traditions. After the interviews, students will transcribe the recordings and present their findings to the class through written reports or presentations. Students will use English to communicate with their group members and present their findings to the class.
APPROX. TIME	A week
LEVEL	Language level B1+
LEARNING OUTCOME	Students will be able to gather and analyze information about local history, traditions, and geography through interviews with community members.
INDICATORS	Students demonstrate active listening skills during interviews, asking appropriate follow-up questions to gain a deeper understanding of the topic. Students use appropriate language and communication skills to effectively communicate with community members. Students analyze and synthesize the information gathered from interviews to develop a more comprehensive understanding of local history, traditions, and geography. Students demonstrate an appreciation for the diversity of cultures and perspectives within their local community.
MATERIALS	Maps, local history books, audio and video recorders, cameras, pencils, paper

ACTIVITY 3	DOCUMENTING LOCAL TRADITIONS
PROCEDURE	Divide students into small groups and assign each group a local tradition to research and document, such as a local festival, culinary tradition, or folk music style. Students will use cameras and audio recorders to document the tradition and interview participants or experts. After the documentation process, students will create a presentation that showcases their findings, including photos, videos, and interviews. Students will use English to communicate with their group members and present their findings to the class.
APPROX. TIME	A week
LEVEL	Language level B1+
LEARNING OUTCOME	Students will be able to document and present the local traditions of their community.
INDICATORS	Students will be able to identify and describe local traditions and their significance. Students will be able to conduct research and gather information about local traditions through various sources, such as interviews, books, and online resources. Students will be able to organize and present their findings through written reports, multimedia presentations, or other creative means. Students will demonstrate an understanding and appreciation of the importance of preserving and sharing local traditions.
MATERIALS	Maps, local history books, audio and video recorders, cameras, pencils, paper

ACTIVITY 4	CREATING A LOCAL TOURISM GUIDE
PROCEDURE	Divide students into small groups and assign each group a section of the local area to create a tourism guide for, such as historical sites, natural landmarks, or cultural experiences. Students will use their research and documentation from the previous activities to create a guide that highlights the unique features and attractions of their assigned section. Students will use English to communicate with their group members and present their tourism guide to the class.
APPROX. TIME	A week
LEVEL	Language level B1+
LEARNING OUTCOME	Students will be able to create a local tourism guide that showcases their community's history, geography, and traditions to potential visitors.
INDICATORS	Students will research and gather information on local historical and cultural sites, landmarks, and events. Students will identify and analyze the unique geographic features and natural resources of their community. Students will create a visually appealing and informative guide that includes descriptions, photos, and maps of the local attractions. Students will use persuasive language to encourage visitors to explore their community and experience its unique offerings.
MATERIALS	Maps, local history books, audio and video recorders, cameras, pencils, paper

ACTIVITY 5	PRESENTATIONS
PROCEDURE	Presentation
APPROX. TIME	2 class period
LEVEL	Language level B1+
LEARNING OUTCOME	Students will be able to effectively present their research on local history, geography, and traditions.
INDICATORS	Students use appropriate language and vocabulary to convey their ideas. Students use visual aids, such as maps and images, to enhance their presentation. Students demonstrate an understanding of their chosen topic through clear and organized presentation.
MATERIALS	Maps, local history books, audio and video recorders, cameras, pencils, paper

ACTIVITY 6	ASSESSMENT
PROCEDURE	Conclusions and evaluation- Students will be asked to write a reflection on their experiences and learning during the project-based learning activities, highlighting what they learned about the local history, geography, and traditions
APPROX. TIME	15 minutes at the end of the presentation
LEVEL	Language level B1+
LEARNING OUTCOME	Draw conclusions and provide feedback and feedforward
INDICATORS	Students can accurately summarize the key takeaways and lessons learned from the project-based learning tasks. Students can provide constructive feedback to their peers
MATERIALS	Notebook, paper, writing tools

Assessment

The assessment will be done according to the following rubric:

CRITERIA	EXEMPLARY (4)	PROFICIENT (3)	DEVELOPING (2)	EMERGING (1)
Research	Conducted thorough research using a variety of sources and incorporated relevant information effectively.	Conducted research using some variety of sources and incorporated some relevant information.	Conducted minimal research using limited sources and incorporated minimal relevant information.	Little to no research conducted and did not incorporate relevant information.
Creativity	Demonstrated exceptional creativity in the project design and presentation.	Demonstrated some creativity in the project design and presentation.	Demonstrated limited creativity in the project design and presentation.	Demonstrated no creativity in the project design and presentation.
Presentation	Presentation was clear, organized, and engaging. Used appropriate visual aids, props, and technology.	Presentation was mostly clear, organized, and engaging. Used some appropriate visual aids, props, and technology.	Presentation was somewhat clear, organized, and engaging. Used limited visual aids, props, and technology.	Presentation was unclear, disorganized, and not engaging. Did not use visual aids, props, or technology.
Use of Local Resources	Demonstrated a strong use of local resources in the project. Incorporated local perspectives and knowledge effectively.	Demonstrated some use of local resources in the project. Incorporated some local perspectives and knowledge.	Demonstrated limited use of local resources in the project. Incorporated minimal local perspectives and knowledge.	Did not use local resources in the project. Did not incorporate local perspectives and knowledge.

Agrupamento de Escolas de Rio Tinto

RIO TINTO, PORTUGAL

ORGANISATION ID: **E10125717**

PROJECT PLAN

SCIENCE
MATHEMATICS

Enhancing Key Competencies Through Project-Based Learning

TITLE: CONTRIBUTE TO THE CONSTRUCTION PROJECT OF THE SWIMMING POOL.

PROJECT IDEA:
A school intends to build a swimming pool for the practice of sports activities in Physical Education classes. Based on this problem situation, the students were encouraged to contribute to the construction project of the swimming pool.
From this initial guiding question it was thought a proposal that could lead students to develop the necessary skills of visualization, analysis, formal and informal deduction in the study of prisms, as well as contribute, in a participatory and critical way, in solving problem situations proposed to them.

AUTHOR: Marina Rebelo

TABLE OF SUMMARY	
Subject(s)	mathematics
Age of students	13-14 years
Number of students	20
Time frame/duration	10h
Learning objectives	The main goals of the project: To understand the content of prisms, through practical investigations, challenge problems and use of digital technologies
Resources and tools	The project will mainly use materials: Board, board marker, pencil, notebook, calculator, computers, GeoGebra software, tape measure, mobile phone, cardboard, square, rulers, multimedia projector, printed activities.
Expected results	The main goals of the project: • Construction of straight prism models by expanding the original ones. • Calculation of area and volume of straight prisms. • Use of Geogebra • Solving problems with areas and volumes.
Key competences http://bit.ly/key_competences	**Literacy competence:** - understand the objectives of the project and the tasks set. - interpret the terms related to the surface - to express themselves orally during the presentation of the project using visual and digital material. - It implies the ability to communicate and connect effectively with others, in an appropriate and creative way. **Mathematical competence:** - ability to develop and apply mathematical thinking and insight to solve a number of problems in everyday situations. - ability and willingness to use mathematical ways of thinking and presenting in real life (formulas, models, constructions, graphs, diagrams). **Digital competence:** - include confident, critical and responsible use and engagement of digital technologies for learning and participation in society. - turn on information and data literacy, communication and cooperation, digital content creation, problem solving and critical thinking. **Personal, social and learning to learn competence:** - effectively manage time and information, - work with others in a constructive way - manage their own learning - learn to learn
Other considerations	Students with special educational needs will have personalized worksheets based on their educational needs

Procedure

Activities

ACTIVITY	PROCEDURE	DESCRIPTION
1. Mapping the Local Area	Divide students into small groups and provide them with maps of the local area. Instruct students to mark important landmarks, bodies of water, and other notable features. Ask students to research the history and significance of each marked location and write a brief description of their findings. Students will use English to communicate with their group members and present their findings to the class.	Groups
2. Interviewing Local Community Members	Instruct students to choose a community member with a strong connection to the local area, such as a business owner, historian, or elder. Students will use audio or video recorders to interview the chosen community member about their experiences and knowledge of the local history, geography, and traditions. After the interviews, students will transcribe the recordings and present their findings to the class through written reports or presentations. Students will use English to communicate with their group members and present their findings to the class.	Individually/groups
3. Documenting Local Traditions	Divide students into small groups and assign each group a local tradition to research and document, such as a local festival, culinary tradition, or folk music style. Students will use cameras and audio recorders to document the tradition and interview participants or experts. After the documentation process, students will create a presentation that showcases their findings, including photos, videos, and interviews. Students will use English to communicate with their group members and present their findings to the class	Individually/groups

ACTIVITY	PROCEDURE	DESCRIPTION
7. Presentation of conclusions in groups	Presentation activities and conclusions.	The images registered by the students will be presented to the class and then discussed with the teacher's guidance. The images presented will meet the following specifications: name of the figure (object); edges, vertices, angles, characteristics or properties of that figure; perimeter, area and volume of that figure.
8. Practical activity 3	Using Geogebra to construct solids and calculating area and volume. Students are using formulas and calculating areas and volume	From the use of GeoGebra software is proposed: - The construction of a hexagonal, regular, straight prism and a cube, as well as the calculation of the area and volume. Then, using an image registered by the group (photo), sketch it on GeoGebra, answering the following items: number of vertices and edges; area and volume of that figure.
9. Practical activity 3	Construction of the outline of a swimming pool, calculation of its area and volume, using Geogebra.	The students will develop a problem situation, elaboration of the project for the construction of a swimming pool in a school, to conduct swimming lessons taking into account: - Each group defines the dimensions of the pool: length, width and depth and draw the project in GeoGebra software..; - The pool should be lined with 20 cm x 20 cm tiles. Check how many tiles are needed; - How many litres of water are needed to fill this pool, and what will the school spend to fill it? (Research the value of a cubic metre of water).
10. Presentation of conclusions in groups	Students use some of the presentation tools (Powerpoint, canva) and make presentations about their work.	Students present the group's chosen plan, its implementation and appropriate resolutions to the class.

ACTIVITY 1	ICE-BREAKING
PROCEDURE	Students answer a digital quiz about geometric solids. Create a simple digital concept map.
APPROX. TIME	1 hour
LEVEL	Language level A 1+
LEARNING OUTCOME	Students describe what solid polyhedrons are - prisms and pyramids and their elements and characteristics. Create a simple digital concept map.
INDICATORS	Correctness of the information provided
MATERIALS	Computador.

ACTIVITY 2	CONSTRUCTION OF SOLID FLAT PATTERNS AND MAGNIFICATION CALCULATIONS.
PROCEDURE	Students are divided into groups. The pupils construct plans of some prisms from models, expanding their measurements by three times.
APPROX. TIME	1 hour
LEVEL	Language level A 1+
LEARNING OUTCOME	The student will be able to build the plans autonomously with the guidance of the teacher.
INDICATORS	I can build the flat patterns using the drawing instruments and perform the magnification calculations correctly.
MATERIALS	Cardstock, ruler, squares, pencil, eraser and scissors.

ACTIVITY 3	COMPLETING A TABLE WITH THE CHARACTERISTICS OF THE SOLIDS BUILT IN ACTIVITY 1.
PROCEDURE	Students make records in a table. For this, they group the solids according to the characteristics and properties that emerged from the previous activity.
APPROX. TIME	1 hour
LEVEL	Language level A 1+
LEARNING OUTCOME	Students should be able to characterize the solids they build.
INDICATORS	I can fill in the frame correctly. Using correct written mathematical communication both linguistically and scientifically.
MATERIALS	Laptop, worksheet.

ACTIVITY 4	PRESENTATIONS OF FINAL CONCLUSIONS
PROCEDURE	Presentations of final conclusions.
APPROX. TIME	30min
LEVEL	Language level A 1+
LEARNING OUTCOME	Description of final conclusions
INDICATORS	Correctness of the information provided
MATERIALS	Laptop.

ACTIVITY 5	ICE BREAKING 2
PROCEDURE	Through an oral questioning in the class group, the teacher leads the students to remember the areas of the flat figures recording the answers on the board.
APPROX. TIME	30min
LEVEL	Language level A 1+
LEARNING OUTCOME	Students describe the perimeters and areas of plane figures.
INDICATORS	Correctness of the information provided
MATERIALS	Whiteboard and board pens.

ACTIVITY 6	PRACTICAL ACTIVITY 2- AREA CALCULATION
PROCEDURE	Students are using formulas and calculating areas.
APPROX. TIME	2 hours
LEVEL	Language level A 1+
LEARNING OUTCOME	Students will be able to apply practical problems and how to solve them.
INDICATORS	I can use formulas for areas of geometrical shapes in practical problems.
MATERIALS	Cell phone, cardstock, ruler, squares, pencil, eraser and scissors.

ACTIVITY 7	PRESENTATION OF CONCLUSIONS IN GROUPS
PROCEDURE	Students use some of the presentation tools (Powerpoint, Canva)and make presentations about their work.
APPROX. TIME	2 hours
LEVEL	Language level A 1+
LEARNING OUTCOME	Students will be able to present their work safely using presentation tools, showing critical and argumentative skills.
INDICATORS	Use correct oral and written mathematical communication, both linguistically and scientifically.
MATERIALS	laptop, paper

ACTIVITY 8	PRACTICAL ACTIVITY 3- USING GEOGEBRA TO BUILD SOLIDS AND CALCULATE AREA AND VOLUME.
PROCEDURE	The construction of a hexagonal prism and a cube and calculation of the area and volume of solids, using Geogebra.
APPROX. TIME	1 hour
LEVEL	Language level A 1+
LEARNING OUTCOME	Use the Geogebra tool to build solids and calculate area and volume.
INDICATORS	I can use the Geogebra tool to build solids and calculate area and volume.
MATERIALS	Laptop.

ACTIVITY 9	PRACTICAL ACTIVITY 4- CONSTRUCTION OF THE OUTLINE OF A SWIMMING POOL, CALCULATION AREA AND VOLUME.
PROCEDURE	The construction of a hexagonal prism and a cube and calculation of the area and volume of solids, using Geogebra.
APPROX. TIME	1 hour
LEVEL	Language level A 1+
LEARNING OUTCOME	Use the Geogebra tool to build solids and calculate area and volume.
INDICATORS	I can use the Geogebra tool to build solids and calculate area and volume.
MATERIALS	Laptop.

ACTIVITY 10	PRESENTATION OF CONCLUSIONS IN GROUPS
PROCEDURE	Students use some of the presentation tools (Powerpoint, canva) and make presentations about their work.
APPROX. TIME	1 hour
LEVEL	Language level A 1+
LEARNING OUTCOME	Students will be able to present their work safely using presentation tools, showing critical and argumentative decision-making skills.
INDICATORS	Use correct oral and written mathematical communication, both linguistically and scientifically.
MATERIALS	Laptop, paper

Assessment

Throughout the project, the teacher guides the activities and all the work. The teacher points out possible errors and questions the processes. At the beginning of each activity, the teacher explains what is intended with it. The teacher is essentially someone who motivates and guides students to achieve the objectives and skills throughout the activities.

The teacher evaluates the collaborative work of the group, the execution of the project, the precision of the objectives and the selected materials, the adequate expression in a foreign language and the presented results.

PROJECT PLAN

SCIENCE
PHYSICS

Enhancing Key Competencies Through Project-Based Learning

TITLE: ONE RACE, 1,2,3 ... ENERGY!

PROJECT IDEA:
With this activity, students will build and design coil races that demonstrate how the elastic energy stored in stretched rubber bands can be used to power “cars” with coil wheels.
The key component of a motor vehicle is its engine, converting the chemical energy stored in gasoline into the kinetic energy of a moving car. Since energy conversion can occur between all different types of energy, fossil fuels are not the only type of energy input. Some vehicles use batteries to store electrical energy, which is converted into kinetic energy.

AUTHOR: Marina Rebelo

TABLE OF SUMMARY	
Subject(s)	Physics
Age of students	13-17 years old
Number of students	20
Time frame/duration	10h
Learning objectives	Study of mechanics, potential energy, kinetic energy.
Resources and tools	Wooden spool (from spools of thread), rubber band, washer, toothpick, tape, pencil, Spool Racer design worksheet, laptop, projector
Expected results	• Discovery of types of energy (kinetic and potential) • Description of interactions between the types of energy • Development of language skills in a foreign language
Key competences http://bit.ly/key_competences	• Mathematical, science, technology and engineering • Digital • Multilingual
Other considerations	Students with special educational needs will have personalized worksheets based on their educational needs

Procedure

Activities

ACTIVITY	PROCEDURE	DESCRIPTION
1.Ice breaking	Students are divided into groups	In this video, we will learn about energy, its two types and forms. https://www.youtube.com/watch?v=6KUP__MR4u8 Students discuss similar situations encountered in everyday life.
2. Interactive slides presentation	PowerPoint Presentation" What is energy?"	It aims to help students identify the types of energy (potential, kinetic) and how energy is used and transferred. A presentation is given" What is energy? "The presentation contains review questions and activities that ask pupils to use their new knowledge about energy.
3. Application of a quiz	Quiz "What is energy?" with five to eight questions and review of answers in class.	Apply a quiz to assess students' understanding of the concepts presented in the lesson. What is energy? Motion energy is called...Stored energy is called...What is energy conversion? Name two things that have energy. Explain how you know them. Review students' answers to assess their level of understanding.

ACTIVITY	PROCEDURE	DESCRIPTION
4. Description of the experiments **“Spool Racer Design and Competition”**	Watching a short film https://youtu.be/vfYmlPLCPzQ Next in groups students design vehicles, using rubber bands, pencils and spools to explore how the elastic potential energy of twisted rubber bands can roll the spools. Students brainstorm, prototype, modify, test and redesign variations to the basic spool racer design to meet different design criteria, finally facing off in a racing competition. These simple-to-make devices store potential energy in twisted rubber bands and then convert the potential energy into kinetic energy upon release.	Through watching the video, they learn to construct and understand how potential energy (stored energy) can be converted into kinetic energy (movement). Distribute to each student: 1 reel, 1 toothpick, 1 pencil, 1 rubber band and 1 washer and a worksheet. Guide students to follow these fundamental steps to make a basic coil run: Squeeze and push the rubber band through the hole in the spool. It helps to use a toothpick or pencil to push it through. Attach the rubber band to one end of the spool by inserting a toothpick into the loop of rubber band coming out of the hole in the spool and securing the toothpick and the loop of rubber band to the spool. Break off any length of toothpick that is longer than the diameter of the spool. On the other side of the spool, pinch and push the other end of the rubber band through a washer. Then slide a pencil through the loop of rubber band coming out of the washer. Holding the reel in one hand, use your other hand to move the pencil around the reel twice so that it wraps the rubber band inside the reel. Place the spool and pencil on a counter or floor and release. Watch the spool racer go! Present students with the challenge: modify your basic coil pilot design to meet the following three criteria - one criterion per test (write on the classroom board): Criterion A: Make the spool racer run as fast as possible. Criterion B: Have the rider run as far as possible in a straight line without overturning. Criterion C: Have the rider run as far as possible over a sloping ramp (<15°). Students in groups brainstorm, design, experiment and race coils to meet various design criteria. These devices store potential energy in twisted rubber bands and then convert the potential energy (stored) into kinetic energy (motion).
5. Presentation of conclusions in groups	Presentation of final conclusions	Students formulate final conclusions in the classroom. The teacher supervises the work of students.

ACTIVITY 1	ICE-BREAKING
PROCEDURE	Students work in groups Electric charging modelling program opens: https://www.youtube.com/watch?v=6KUP__MR4u8 Students discuss similar situations encountered in everyday life.
APPROX. TIME	15 min
LEVEL	Language level A 1+
LEARNING OUTCOME	Description of electrical charging phenomena observed in everyday life.
INDICATORS	Correctness of the information provided
MATERIALS	Computer, projector

ACTIVITY 2	INTERACTIVE SLIDES PRESENTATION
PROCEDURE	PowerPoint Presentation" What is energy?"
APPROX. TIME	20 min
LEVEL	Language level A 1+
LEARNING OUTCOME	Identify what potential energy and kinetic energy are and how energy is used and transferred.
INDICATORS	Correct written expression both linguistically and scientifically
MATERIALS	Laptot, projector

ACTIVITY 3	APPLYING A QUIZ
PROCEDURE	Application of a quiz and verification of the answers in the class.
APPROX. TIME	30 min
LEVEL	Language level A 1+
LEARNING OUTCOME	Answer the questions correctly.
INDICATORS	Correct written expression both linguistically and scientifically.
MATERIALS	Laptops

ACTIVITY 4	THE DESCRIPTION OF THE EXPERIMENT
PROCEDURE	Description of the experiments “Spool Racer Design and Competition
APPROX. TIME	120min
LEVEL	Language level A 1+
LEARNING OUTCOME	After this activity, students should be able to: Explain the difference between kinetic energy and potential energy. Explain in simple terms the power conversion mechanism of an engine. Give meaning to the phenomena associated with energy transfer. Design with respect to certain design criteria.
INDICATORS	Correct expression both linguistically and scientifically
MATERIALS	Wooden spool (from spools of thread), rubber band, washer, toothpick, tape, pencil, Spool Racer design worksheet

ACTIVITY 5	PRESENTATION OF CONCLUSIONS
PROCEDURE	Presentations of final conclusions in groups.
APPROX. TIME	50 min
LEVEL	Language level A 1+
LEARNING OUTCOME	Description of final conclusions
INDICATORS	Correct written expression both linguistically and scientifically. Correctness of the information provided
MATERIALS	Laptop, interactive smartboard

Assessment

Students will be assessed using an observation grid in which the accuracy of scientific material, proper expression in a foreign language, team collaboration, project execution, and presentation style will all be considered.

The learning objectives were met if:

- Students were able to define from a scientific point of view, precisely the types of enrgy and how potential energy (stored energy) can be converted into kinetic energy (motion).
- Students correctly constructed and presented the project from a linguistic perspective.

POLAND

Technikum Informatyki Edukacji Innowacyjnej

ŁÓDŹ, POLAND

ORGANISATION ID: **E10117366**

PROJECT PLAN

SCIENCE GEOGRAPHY/ENGLISH

Enhancing Key Competencies Through Project-Based Learning

TITLE: FORCED MIGRATION CAUSED BY GLOBAL WARMING – STRATEGIC AND HABITAT MODEL

PROJECT IDEA:
Global warming is the long-term heating of Earth's surface. Students research global warming phenomena with its threats to people, climate change and disastrous impact on any region, location etc. They also research migration process, its cause and factors. Students provide a plan of a forced migration process caused by global warming phenomena explaining migration methods, evacuation plan, selection of people and the most important materials. They acquire citizenship, cultural awareness, digital, entrepreneurship, literacy, scientific and language skills throughout this method.

AUTHOR: Dominik Wróblewski

TABLE OF SUMMARY	
Subject(s)	Geography and English
Age of students	15-19 years old
Number of students	20
Time frame/duration	3 hours 35 minutes
Learning objectives	Learning objectives are: • Learning about the selection process by simulating a committee session; • Creating a program or official agenda; • Making predictions about economic, social or political areas; • Simulation method of forced migration; • The study of migration issues; • The study of global warming; • Using a model to predict and discuss probability issues; • Transferring knowledge to new problems and solutions; • Re-defining difficult situations and solutions; • Engaging in social interactions.
Resources and tools	Paper, cards, pens, pencils, laptops, interactive smartboard, geographical map (paper or digital format), online sources: https://www.worldbank.org/en/news/press-release/2018/03/19/climate-change-could-force-over-140-million-to-migrate-within-countries-by-2050-world-bank-report https://www.youtube.com/watch?v=unMXBc2MWTc&feature=emb_logo
Expected results	Results: • Discovery of migration methods; • Description of evacuation plan, the selection of personnel and the most important materials i.e. fuel, food and water, medical drugs; • Description of the foundations of a migrated society, new regulations, rules, laws etc.; • Development of language skills in a foreign language.
Key competences http://bit.ly/key_competences	**Citizenship** - being able to cope in a constructive way with conflicts as a citizen; - being able to manage time to finish a task; - being responsible; - cooperating with others; - having analytical and critical thinking skills; - obtaining conflict-resolution skills; - self-efficacy. **Cultural awareness and expression** - being ambassadors of culture; - being aware of cultural context; - being creative in expressing ideas; - improving the ability to express and interpret abstract ideas and experiences; - improving the ability to identify and realize opportunities for personal and social value.

TABLE OF SUMMARY	
Key competences **http://bit.ly/key_competences** (CONTINUATION)	**Digital** - finding information and/or verifying the accuracy of the information found on the Internet; - improving the awareness of new technologies and how they can support teaching and learning processes; - producing, storying and analyzing information; - using different media means such as mobile phones, laptops, apps; - using of information technology for developing sustainable work activities. **Entrepreneurship** - combining creativity, a sense of initiative, problem-solving and technological knowledge; - developing practical skills; - improving positive self-esteem; - improving strategic thinking and planning skills; - raising awareness of personal abilities. **Literacy** - being able to extract relevant information from different sources; - gaining knowledge through reading texts as well as using technology; - generating various strategies and techniques; - identifying and implement the task; - increasing quantitative reasoning. **Mathematical and basic competences in science and technology** - enabling individuals to better understand the advances, limitations and risks of scientific theories, applications and technology in societies in relation to decision-making, values, moral questions, culture, etc.; - improving the ability to use and handle technological tools as well as scientific data to achieve a goal or to reach an evidence-based decision or conclusion; - solving problematic situations by selecting relevant data, analyzing possible strategies and reviewing process and results. **Multilingual** - developing the ability to think divergently; - expressing ideas, opinions, feelings, needs and facts in English language; - presentation skills; - self-enhancement; - understanding others; - using English in different life situations. **Personal and social** - being able to organize and manage learning; - being able to manage time to finish a task; - being responsible for doing a task; - increasing critical thinking; - increasing knowledge about social and personal life situations; - knowing how to increase motivation and self-confidence; - knowing learning abilities and optimal use of time, information and learning opportunities; - stimulating and improve soft skills; - stimulating students' creativity and imagination, observation skills, comparison and classification techniques.
Other considerations	Students with small level of disabilities like dyslexia can participate in the project without special adaptation. Students with higher level of disabilities can participate in less demanding tasks.

Procedure

Activities

ACTIVITY	PROCEDURE	DESCRIPTION
1.Ice breaking Activity 1	Students are divided into groups. Students are accustomed with global warming and migration process.	Migration process opens: https://www.worldbank.org/en/news/press-release/2018/03/19/climate-change-could-force-over-140-million-to-migrate-within-countries-by-2050-world-bank-report Students discuss similar situations encountered in everyday life.
2. Model Committee Session Activity	Each group has to run a model of committee session. Each member has to take on a different role.	It aims to help students identify the types of energy (potential, kinetic) and how energy is used and transferred. A presentation is given" What is energy? "The presentation contains review questions and activities that ask pupils to use their new knowledge about energy.
3. Ice-breaking Activity 2	Film about climate change and its impact on migration process.	Students watch film about how climate change directly impacts people migration: https://www.youtube.com/watch?v=unMXBc2MWTc&feature=emb_logo Students discuss and write main factors and/or direct impacts of climate change onto migration process.
4. Forced Migration Simulation Activity	Students run a forced migration simulation.	Students prepare evacuation plans, coordinate the selection of personnel, coordinate the selection of fuel, cultural artifacts, food and water, medical drugs, etc. They have to set down the foundations and set new rules, regulations, laws of a new society.
5. Description of the evacuation plans and a new settlement	Description of evacuation plans and a new settlement. Realization of the project.	Students outline their evacuation plans and selection process. They present their decisions, regulations, rules, laws of a newly-formed societies. They have to explain their decisions that were made considering evacuation plan, selection process and settlement issues. Groups involve in discussion.
6. Presentation of conclusions in groups	Presentations of final conclusions.	Students formulate final conclusions in the classroom. The teacher supervises the work of students.

ACTIVITY 1	ICE-BREAKING
PROCEDURE	Students are divided into groups. Students are accustomed with global warming and migration process.
APPROX. TIME	15 min
LEVEL	Language level B1+
LEARNING OUTCOME	Description of global warming and migration issues
INDICATORS	Correctness of the information provided
MATERIALS	Laptop, interactive smartboard, geographical maps (paper or digital), paper, cards, pens, pencils

ACTIVITY 2	MODEL COMMITTEE SESSION
PROCEDURE	Each group has to run a model of committee session. Each member has to take on a different role.
APPROX. TIME	15 min
LEVEL	Language level B1+
LEARNING OUTCOME	Engaging in social interactions
INDICATORS	How to divide group members, making responsible decisions
MATERIALS	Laptop, geographical maps (paper or digital), paper, cards, pens, pencils

ACTIVITY 3	ICE-BREAKING 2
PROCEDURE	Film about climate change and its impact on migration process.
APPROX. TIME	30 min
LEVEL	Language level B1+
LEARNING OUTCOME	Students describe main factors and/or direct impacts of climate change onto migration process
INDICATORS	Correct written expression both linguistically and scientifically
MATERIALS	Laptops, smartboard, pens, pencils, paper, cards

ACTIVITY 4	FORCED MIGRATION SIMULATION
PROCEDURE	Students run a forced migration simulation.
APPROX. TIME	45 min
LEVEL	Language level B1+
LEARNING OUTCOME	Learning about the selection process, creating official program, making predictions about economic, social or political areas, transferring knowledge to new problems and solutions, re-defining difficult situations
INDICATORS	Correct written expression both linguistically and scientifically
MATERIALS	Laptops, interactive smartboard, paper, cards, pens, pencils, geographical maps

ACTIVITY 5	DESCRIPTION OF THE EVACUATION PLANS AND A NEW SETTLEMENT
PROCEDURE	Description of evacuation plans and a new settlement. Realization of the project.
APPROX. TIME	30 min
LEVEL	Language level B1+
LEARNING OUTCOME	Description of the evacuation plans and selection process; students present their plans and answer questions from colleagues
INDICATORS	Correctness of the information provided
MATERIALS	Laptop, interactive smartboard, geographical maps

ACTIVITY 5	PRESENTATION OF CONCLUSIONS IN GROUPS
PROCEDURE	Presentations of final conclusions.
APPROX. TIME	10 min
LEVEL	Language level B1+
LEARNING OUTCOME	Description of final conclusions
INDICATORS	Correctness of the information provided
MATERIALS	Laptop, interactive smartboard

Assessment

Teacher supervises each activity and the entire work during working in groups. Each activity is explained with purpose and goals to achieve. Teacher assesses team collaboration, project execution, accuracy of selected personnel and materials, proper expression in a foreign language and the style of presented results.

Students reach the goal of the project if they:

- are able to formulate evacuation plans;
- are able to select needed personnel and choose needed materials;
- are able to make predictions about economic, social or political areas;
- are able to use a model to predict and discuss probability issues;
- correctly construct and present the project from a linguistic perspective;
- re-define difficult situations and solutions.

PROJECT PLAN

SCIENCE
PHYSICS/ENGLISH

Enhancing Key Competencies Through Project-Based Learning

TITLE: REFRACTION AND REFLECTION OF LIGHT

PROJECT IDEA:
Light is a complex phenomenon. It is a kind of energy called electromagnetic radiation of any wavelength that is visible or not. The primary properties of light are intensity, propagation direction, frequency or wavelength spectrum and polarization. Different sources produce different kinds of light e.g. sun, fireflies, TVs, fireworks. Students have to discover and learn different models to describe properties of light and different aspects of its behavior. They have to describe interactions between light and matter. They acquire citizenship, cultural awareness, digital, entrepreneurship, literacy, scientific and language skills throughout this method.

AUTHOR: Abdullah Abdulljabar Naji

TABLE OF SUMMARY	
Subject(s)	Physics and English
Age of students	15-19 years old
Number of students	20
Time frame/duration	3 hours 35 minutes
Learning objectives	Learning objectives are: • Developing observation skills and the ability to make connections and suppositions; • Engaging in social interactions; • Making predictions about refraction and reflection of light; • Observing, understanding and acknowledging physic laws that regulate phenomena of refraction and reflection of light; • Re-defining observed situations and ensued solutions; • The study of reflection of light; • The study of refraction of light; • Using experimental methods to discover refraction and reflection of light methods; • Transferring knowledge to social life.
Resources and tools	Laptops, interactive smartboard, paper, mirrors, glass of water, metal ruler, TV screen, window, online sources: https://www.youtube.com/watch?v=zHi6i-QAYj0 https://www.youtube.com/watch?v=ZZNF6JZ4e60
Expected results	Results: • Discovery of reflection and refraction of light methods; • Description of scientific reflection and refraction of light; • Development of language skills in a foreign language; • Reproduce simple experiments that they have been introduced to.
Key competences http://bit.ly/key_competences	**Citizenship** - being able to manage time to finish a task; - being responsible; - cooperating with others; - having analytical and critical thinking skills; - obtaining conflict-resolution skills; - self-efficacy. **Cultural awareness and expression** - being aware of cultural context; - being creative in expressing ideas; - improving the ability to express and interpret abstract ideas and experiences; - improving the ability to identify and realize opportunities for personal and social value. **Digital** - finding information and/or verifying the accuracy of the information found on the Internet; - improving the awareness of new technologies and how they can support teaching and learning processes; - producing, storying and analyzing information; - using different media means such as mobile phones, laptops, apps; - using of information technology for developing sustainable work activities.

TABLE OF SUMMARY	
Key competences **http://bit.ly/key_competences** (CONTINUATION)	**Entrepreneurship** - combining creativity, a sense of initiative, problem-solving and technological knowledge; - developing practical skills; - improving positive self-esteem; - improving strategic thinking and planning skills; - raising awareness of personal abilities. **Literacy** - being able to extract relevant information from different sources; - gaining knowledge through reading texts as well as using technology; - generating various strategies and techniques; - identifying and implement the task; - increasing quantitative reasoning. **Mathematical and basic competences in science and technology** - enabling individuals to better understand the advances, limitations and risks of scientific theories, applications and technology in societies in relation to decision-making, values, moral questions, culture, etc.; - improving the ability to use and handle technological tools as well as scientific data to achieve a goal or to reach an evidence-based decision or conclusion; - solving problematic situations by selecting relevant data, analyzing possible strategies and reviewing process and results. **Multilingual** - developing the ability to think divergently; - expressing ideas, opinions, feelings, needs and facts in English language; - presentation skills; - self-enhancement; - understanding others; - using English in different life situations. **Personal and social** - being able to organize and manage learning; - being able to manage time to finish a task; - being responsible for doing a task; - increasing critical thinking; - increasing knowledge about social and personal life situations; - knowing how to increase motivation and self-confidence; - knowing learning abilities and optimal use of time, information and learning opportunities; - stimulating and improve soft skills; - stimulating students' creativity and imagination, observation skills, comparison and classification techniques.
Other considerations	Students with small level of disabilities like dyslexia can participate in the project without special adaptation. Students with higher level of disabilities can participate in less demanding tasks.

Procedure

Activities

ACTIVITY	PROCEDURE	DESCRIPTION
1.Ice breaking Activity 1	Students are divided into groups. Students are accustomed with refraction and reflection of light.	Refraction and reflection of light: https://www.youtube.com/watch?v=zHi6i-QAYj0 Students discuss similar situations encountered in everyday life.
2. Experimental Activity	Experimental film. Experimental activity.	Students watch the film with refraction and reflection of light, choose the experimental materials and repeat the experiment. **The film:** https://www.youtube.com/watch?v=ZZNF6JZ4e60 Students discuss and write main refraction and reflection methods.
3. Description of experiments	Description of experiments. Realization of the project presentations.	Students formulate in writing what they observed and present their project presentations.
4. Presentation of conclusions in groups	Presentations of experiments and final conclusions.	Students present their project presentations and formulate final conclusions in the classroom. The teacher supervises the work of students.

ACTIVITY 1	ICE-BREAKING
PROCEDURE	Students are divided into groups. Students are accustomed with refraction and reflection of light.
APPROX. TIME	20 min
LEVEL	Language level B1+
LEARNING OUTCOME	Description of refraction and reflection of light phenomenon
INDICATORS	Correctness of the information provided
MATERIALS	Laptop, interactive smartboard

ACTIVITY 2	EXPERIMENTAL ACTIVITY
PROCEDURE	Each group watches experimental film.
APPROX. TIME	50 min
LEVEL	Language level B1+
LEARNING OUTCOME	Conducting experiments
INDICATORS	How to conduct experiments, observed technical skills, make responsible decisions, correct expressions in a foreign language
MATERIALS	Laptop, TV screen, window, glass of water, metal ruler, paper, cards, pens, pencils

ACTIVITY 3	DESCRIPTION OF EXPERIMENTS
PROCEDURE	Description of experiments. Realization of the project presentations.
APPROX. TIME	30 min
LEVEL	Language level B1+
LEARNING OUTCOME	Students describe experiments and make presentations with pictures or/and films taken during experimental activities with scientific explanations
INDICATORS	Correct written expression both linguistically and scientifically
MATERIALS	Laptops, interactive smartboard, pens, pencils, paper, cards

ACTIVITY 4	PRESENTATION OF CONCLUSIONS IN GROUPS
PROCEDURE	Presentations of final conclusions.
APPROX. TIME	20 min
LEVEL	Language level B1+
LEARNING OUTCOME	Description of project presentations and final conclusions. Students answer questions from colleagues
INDICATORS	Correct written expression both linguistically and scientifically
MATERIALS	Laptops, interactive smartboard

Assessment

Teacher supervises each activity and the entire work during working in groups. Each activity is explained with purpose and goals to achieve. Teacher assesses team collaboration, project execution, accuracy of selected personnel and materials, proper expression in a foreign language and the style of presented results.

Students reach the goal of the project if they:

- are able to define the ways of refraction and reflection of light;
- are able to make predictions about refraction and reflection of light;
- are able to observe, understand and acknowledge physic laws that regulate phenomena of refraction and reflection of light;
- correctly construct and present the project from a linguistic perspective;
- re-define observed situations and ensued solutions.

Osnovna škola Višnjevac

VISNJEVAC, CROATIA

ORGANISATION ID: **E10021477**

PROJECT PLAN

SCIENCE
PHYSICS

Enhancing Key Competencies Through Project-Based Learning

TITLE: ACCEPT THE FRICTION CHALENGE !

PROJECT IDEA:
Friction is an important part of our daily life. Static friction and the coefficient of static friction, dynamic friction and rolling friction have their own consequences and are applied depending on the situation. Students will perform experiments to observe the cause-and-effect relationship of friction. They will perform experiments and measure physical quantities and calculate required values such as the coefficient of friction depending on the type of contact surfaces.

AUTHOR: Mirjana Bagarić

TABLE OF SUMMARY	
Subject(s)	physics
Age of students	13-14 years old
Number of students	20
Time frame/duration	one week
Learning objectives	The main goals of the project: - determination of static sliding friction factor - determination the dynamic sliding friction factor - explore the rolling friction
Resources and tools	The project will use materials: paper, scissors, ruler, tribometer with slope, „mufa“, tripod rod, tripod base, friction bodies (wood, sandpaper, rubber,...), tape measure, plumbline, two books with reinforcements, friction bodies (wood, sandpaper, rubber), thread, set of weights or pebbles, digital kitchen scale, bowl, hook, 2 bananas, shoe, hand scale (0-50 kg), rope thicker than 3 m, belt of 1 m, wooden box (100 cm x 50 cm), 50 tennis balls or larger balls (can also be 10 round sticks), pencil, calculator. The tool for presenting project results will be Powerpoint.
Expected results	Students will see the importance of friction in everyday life. First, static friction - how much force is needed to move the body. Then dynamic friction - friction during body motion and finally how to reduce friction between two bodies.
Key competences http://bit.ly/key_competences	Literacy competence Mathematical competence, competence in science, technology and engineering Digital competence Personal, social and learning to learn competence
Other considerations	Students with small disabilities (such as dyslexia), as those included in the regular program, can participate in the work without special adaptation. Students with a higher degree of difficulty can participate in less demanding tasks (drawing rectangles, cutting surfaces, stacking squares of units)

Procedure

Activities

ACTIVITY	PROCEDURE	DESCRIPTION
1.Friction - determination of static sliding friction factor **Accept the challenge of friction and at the end of this workshop try to separate two books that are intertwined without glue. Enter the hall of fame and win an award!**	1.Conducting an experiment for static sliding friction on an inclined tribometer and calculate the static sliding friction factor for the given bodies (cubes or quadar). Performimg the same experiment at least several times for each body. 2.Compile the tables for all the experiments of this workshop and write the measurement results in the tables. Calculate the arithmetic mean of each set of measurements (mean value of measurements). 3.Intertwine the given two books by putting the page of the other book on the page of one book. Try to separate them by pulling.	The teacher explains how to start the experiment, guides and controls the students. Students conduct an experiment with pre-written instructions.
2. *Friction- determining the dynamic sliding friction factor* **How slippery is a banana? In order to come to a conclusion about the slippery nature of the banana, you need to perform a couple of physics experiments.**	1.Conducting an experiment for dynamic sliding friction on a tribometer and calculate the dynamic friction factor for the given body (squares with hooks). Perform the same experiment at least several times for each body. 2.Turn the tribometer to the other side and perform the previous experiment with one shoe or sneaker of the workshop participant. 3.Carry out experiments with the shoe or sneaker from the previous experiment by loading it with some mass (eg 1 kg or 2 kg, if you don't have weights you can put smaller weights, stones,...). 4.Carry out experiment 2, but now by placing a banna peel between the shoe and the tribometer, and calculate the dynamic friction factor. Carry out at least a few similar experiments by changing the conditions with the banana peel (eg banana peel downwards or upwards, 2 peels facing each other, banana peels placed crosswise, ..., let your imagination run wild). 5.Compiling the tables for all the experiments and write the measurement results in the tables. Calculate the arithmetic mean of each set of measurements (mean value of measurements).	The teacher explains how to start the experiment, guides and controls the students. Students conduct an experiment with pre-written instructions. The teacher leads the students without saying the final formulas, the point is self-learning from practical work.

Procedure

Activities (continuation)

ACTIVITY	PROCEDURE	DESCRIPTION
3. *Friction - rolling friction* **Why does the spinner spin for so long?** **Regardless of your knowledge of performing tricks with a spinner, try your hand at performing a physics experiment to confirm the answer to the question from the title of this exercise**	1.Calculate the force (by measuring the mass) required to pull the student (in a sitting position) on the box across the floor. 2.Calculate the force, similar to the first task, needed to pull the student across the floor when there are balls or rollers between the wooden box and the floor. 3.Compile a table for all participants of this workshop according to the template in the text. 4.Prepare a presentation and briefly present the workshop and the main conclusions of the experiment to the participants of other workshops, the presentation time should be within 5 minutes.	The teacher explains how to start the experiment, guides and controls the students. Students conduct an experiment with pre-written instructions. The teacher leads the students without saying the final formulas, the point is self-learning from practical work.

ACTIVITY 1	FRICTION - DETERMINATION OF STATIC SLIDING FRICTION FACTOR
Accept the challenge of friction and at the end of this workshop try to separate two books that are intertwined, without glue. Enter the hall of fame and win an award!	
PROCEDURE	1. Conducting an experiment for static sliding friction on an inclined tribometer and calculate the static sliding friction factor for the given bodies (cubes or quadar). Performimg the same experiment at least several times for each body. 2. Compile the tables for all the experiments of this workshop and write the measurement results in the tables. Calculate the arithmetic mean of each set of measurements (mean value of measurements). 3. Intertwine the given two books by putting the page of the other book on the page of one book. Try to separate them by pulling.
APPROX. TIME	2h
LEVEL	Language level A1+
LEARNING OUTCOME	The student will be able to determinate of static sliding friction factor
INDICATORS	I understand what is static sliding factor and I can apply it in daily use
MATERIALS	Tribometer with slope, „mufa“, tripod rod, tripod base, friction bodies (wood, sandpaper, rubber,...), tape measure, plumbline, two books with reinforcements, pencil, calculator.

ACTIVITY 2	FRICTION- DETERMINING THE DYNAMIC SLIDING FRICTION FACTOR
How slippery is a banana? In order to come to a conclusion about the slippery nature of the banana, you need to perform a couple of physics experiments	
PROCEDURE	1. Conducting an experiment for dynamic sliding friction on a tribometer and calculate the dynamic friction factor for the given body (squares with hooks). Perform the same experiment at least several times for each body. 2. Turn the tribometer to the other side and perform the previous experiment with one shoe or sneaker of the workshop participant. 3. Carry out experiments with the shoe or sneaker from the previous experiment by loading it with some mass (eg 1 kg or 2 kg, if you don't have weights you can put smaller weights, stones,...). 4. Carry out experiment 2, but now by placing a banana peel between the shoe and the tribometer, and calculate the dynamic friction factor. Carry out at least a few similar experiments by changing the conditions with the banana peel (eg banana peel downwards or upwards, 2 peels facing each other, banana peels placed crosswise, ..., let your imagination run wild). 5. Compiling the tables for all the experiments and write the measurement results in the tables. Calculate the arithmetic mean of each set of measurements (mean value of measurements).
APPROX. TIME	2h
LEVEL	Language level A1+
LEARNING OUTCOME	The student will be able to determinate of dinamic sliding friction factor
INDICATORS	I understand what is dinamic sliding factor and I can apply it in daily use
MATERIALS	Tribometer (wooden board) with pulley, friction bodies (wood, sandpaper, rubber), thread, set of weights or pebbles, digital kitchen scale, bowl, hook, 2 bananas, shoe, paper, pencil, calculator.

ACTIVITY 3	FRICTION - ROLLING FRICTION
Why does the spinner spin for so long? Regardless of your knowledge of performing tricks with a spinner, try your hand at performing a physics experiment to confirm the answer to the question from the title of this exercise	
PROCEDURE	1. Calculate the force (by measuring the mass) required to pull the student (in a sitting position) on the box across the floor. 2. Calculate the force, similar to the first task, needed to pull the student across the floor when there are balls or rollers between the wooden box and the floor. 3. Compile a table for all participants of this workshop according to the template in the text. 4. Prepare a presentation and briefly present the workshop and the main conclusions of the experiment to the participants of other workshops, the presentation time should be within 5 minutes.
APPROX. TIME	2h
LEVEL	Language level A1+
LEARNING OUTCOME	The student will be able to understand rolling friction and to compare it with sliding friction
INDICATORS	I understand what is rolling friction and I can apply it in daily use
MATERIALS	hand scale (0-50 kg), rope thicker than 3 m, belt of 1 m, wooden box (100 cm x 50 cm), 50 tennis balls or larger balls (can also be 10 round sticks), paper, pencil, calculator.

Assessment

During the work, the teacher supervises each activity and the entire work. The teacher points out possible mistakes. Each activity is explained at the beginning and what the goals of the activity are. Students will eventually reach the goal of the project, which is to calculate static sliding factor, dinamis sliding factor and the difference among sliding and rolling friction.

PROJECT PLAN

SCIENCE
MATHS

Enhancing Key Competencies Through Project-Based Learning

TITLE: WHAT IS THE SIZE OF THE SURFACE?

PROJECT IDEA:
Measure and calculate the area of figures such as rectangles, squares, right triangles or any triangle. Pave with unit squares and come up with a mathematical formula for calculating the area of a figure. Through research, students will gain constant knowledge on how to calculate the size of a surface and generally calculate some of the lengths if the area is given. They will be able to estimate the size of the area by knowing what the basic units of measurement for measuring the area are.

AUTHOR: Mirjana Bagarić

TABLE OF SUMMARY	
Subject(s)	mathematics
Age of students	13-14 years old
Number of students	20
Time frame/duration	two weeks
Learning objectives	The main goals of the project: - get an impression of the size of the area - estimate the size of the area - make a square meter and get an impression of its size with the ultimate goal of lasting ability to determine the size of the surface and generally compare the size of surfaces
Resources and tools	The project will mainly use materials: paper, scissors, ruler. Can be used as an additional tool program of dynamic geometry Geogebra or Sketchpad so that students can see that the diameter of any of the parameters of the figure changes or does not change the size of the surface. The tool for presenting project results will be Powerpoint.
Expected results	Making a model of square meter, square decimeter, square centimeter. Making a triangle model as a practical proof of the formula for the area of a triangle. Calculating the size of the surface.
Key competences **http://bit.ly/key_competences**	**Literacy competence:** - understand the objectives of the project and the tasks set. - interpret the terms related to the surface - to express themselves orally during the presentation of the project using visual and digital material. - It implies the ability to communicate and connect effectively with others, in an appropriate and creative way. **Mathematical competence:** - ability to develop and apply mathematical thinking and insight to solve a number of problems in everyday situations. - ability and willingness to use mathematical ways of thinking and presenting in real life (formulas, models, constructions, graphs, diagrams). **Digital competence**: - include confident, critical and responsible use and engagement digital technologies for learning and participation in society. - turn on information and data literacy, communication and cooperation, digital content creation, problem solving and critical thinking **Personal, social and learning to learn competence:** - effectively manage time and information, - work with others in a constructive way - manage their own learning - learn to learn
Other considerations	Students with small disabilities (such as dyslexia), as those included in the regular program, can participate in the work without special adaptation. Students with a higher degree of difficulty can participate in less demanding tasks (drawing rectangles, cutting surfaces, stacking squares of units)

Procedure

Activities

ACTIVITY	PROCEDURE	DESCRIPTION
1. make one square meter, one hundred square decimeter, one hundred square centimeter	Students will make a square meter, decimeter and centimeter out of thicker paper.	The teacher explains how to draw unit squares on paper, guides and controls the students. Students draw and cut.
2 make a rectangle and a square according to the given measures, make a right triangle of legs equal to the sides of a rectangle	Students will make these shapes out of thicker paper. Students put together unit squares and derive formulas for calculating area, A = ab, A = a2, A = (ab):2.	The teacher explains how to draw these shapes on paper, guides and controls the students. Students draw and cut. The teacher leads the students without saying the final formulas, the point is self-learning from practical work.
3. make two equal triangles out of paper	Students will make these shapes out of thicker paper. Students make from rectangles two equal triangles. They have to discover that the formula for calculating the area of a triangle comes from the formula for the area of a rectangle.	The teacher explains how to draw these shapes on paper, guides and controls the students. Students draw and cut. The teacher leads students without saying the final formulas, the point is self-learning from practical work.
4. practice converting surface units and formulas for the surface of geometrical shapes on different tasks	Students are using unit squares and calculating areas, converting units from bigger to smaller and vice versa. Students are using formulas and calculatie areas.	The teacher supervises the work of the students. It indicates the existence of an error, but not the exact solution. He/she returns the student to the beginning of the work. The point is self-learning from practical work.
5. calculate the area of the sides of the house due to the installation of thermal insulation	**Students are using formulas and calculating areas.**	The teacher supervises the work of the students. It indicates the existence of an error, but not the exact solution. He/she returns the student to the beginning of the work. The point is self-learning from practical work.
6.make a presentation and do the conclusion	Students use some of the presentation tools (Powerpoint, canva) and make presentations about their work. They also make a poster about their work.	The teacher supervises the work of students

ACTIVITY 1	MAKE ONE SQUARE METER, ONE HUNDRED SQUARE DECIMETER, ONE HUNDRED SQUARE CENTIMETER
PROCEDURE	make one square meter, one hundred square decimeter, one hundred square centimeter
APPROX. TIME	1 hour
LEVEL	Language level A 1+
LEARNING OUTCOME	the student will be able to experience the size of the unit squares and compare them
INDICATORS	I know how to make a unit for an area and I am aware of how big it is. I can compare sizes.
MATERIALS	Thicker paper, scissors, ruler

ACTIVITY 2	MAKE A RECTANGLE AND A SQUARE ACCORDING TO THE GIVEN MEASURES, MAKE A RIGHT TRIANGLE OF LEGS EQUAL TO THE SIDES OF A RECTANGLE
PROCEDURE	Students will make these shapes out of thicker paper.Students put together unit squares and derive formulas for calculating area, A = ab, A = a2, A = (ab):2
APPROX. TIME	1 hour
LEVEL	Language level A 1+
LEARNING OUTCOME	The student will be able to state the formula for the area obtained by self-learning work with the help of geometrical shapes.
INDICATORS	I can calculate the area of a rectangle, a square and a right triangle.
MATERIALS	Thicker paper, scissors, ruler

ACTIVITY 3	MAKE TWO EQUAL TRIANGLES OUT OF PAPER
PROCEDURE	Students will make these shapes out of thicker paper. Students make from rectangles two equal triangles. They have to discover that the formula for calculating the area of a triangle comes from the formula for the area of that rectangle.
APPROX. TIME	2h
LEVEL	Language level A 1+
LEARNING OUTCOME	Students will be able to state the formula for the area of a triangle obtained by self-learning work with the help of geometrical shapes.
INDICATORS	I can calculate the area of a rectangle, a square and a right triangle.
MATERIALS	Thicker paper, scissors, ruler

ACTIVITY 4	PRACTICE CONVERTING SURFACE UNITS AND FORMULAS FOR THE SURFACE OF GEOMETRICAL SHAPES ON DIFFERENT TASKS
PROCEDURE	Students are using unit squares and calculating areas, converting units from bigger to smaller and vice versa. Students are using formulas and calculating areas.
APPROX. TIME	1h
LEVEL	Language level A 1+
LEARNING OUTCOME	Students will be able to convert area units and calculate areas.
INDICATORS	I can convert area units and calculate areas
MATERIALS	Paper, pencil, ruler

ACTIVITY 5	CALCULATE THE AREA OF THE SIDES OF THE HOUSE DUE TO THE INSTALLATION OF THERMAL INSULATION
PROCEDURE	Students are using formulas and calculating areas.
APPROX. TIME	2 hours
LEVEL	Language level A 1+
LEARNING OUTCOME	Students will be able to apply what they have learned in everyday life and various practical problems and how to solve them.
INDICATORS	I can use formulas for areas of geometrical shapes in practical problems.
MATERIALS	Paper, ruler

ACTIVITY 6	MAKE A PRESENTATION AND DO THE CONCLUSION
PROCEDURE	Students use some of the presentation tools (Powerpoint, Canva) and make presentations about their work. They also make a poster about their work and they present it to others.
APPROX. TIME	2 hours
LEVEL	Language level A 1+
LEARNING OUTCOME	Students will be able to present their work in a safe way using presentation tools.
INDICATORS	I can use formulas for areas of geometrical shapes in practical problems.
MATERIALS	Laptop, paper

Assessment

During the work, the teacher supervises each activity and the entire work. The teacher points out possible mistakes. Each activity is explained at the beginning and what the goals of the activity are. Students will eventually reach the goal of the project, which is to calculate the area, gain an impression of the size of the area and be able to estimate the size of the area.

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